All that's new and newsworthy in voice, signal and data communication.

COMMUNICATIONS news

COVERING THE TOTAL COMMUNICATIONS INDUSTRY

December 1972

ROUTE TO: | IN | OUT

A Harcourt Brace Jovanovich Publication

Volume 9, Number 12

One WUI Plaza!

MAYOR JOHN LINDSAY of New York not only changed the name of Battery Place North to "WUI Plaza" but also was on hand, here flanked by Lowell Broomall, senior vice president of WUI (left), Ed Gallagher, president of WUI, and Clement Segal, counsel to the city council, to perform the ribbon cutting ceremony at the dedication of the new WUI Building (see story, page 12).

Late Bits

A readout of communications news at presstime

MARTIN MARIETTA HAS an order from Mountain Bell for a new high-capacity digital paging system to serve 60,000 subscribers at a call rate of 13,500 customers per hour.

COASTCOM AND GRANGER WILL *share a million dollar contract to provide 960 MHz relay links (Granger) and multiplex equipment (Coastcom) for a 106-terminal broadcast microwave net in Iran.*

PLANTRONICS IS NEW NAME of Pacific Plantronics, thanks to official action of stockholders who also upped authorized common stock from 2,000,000 to 5,000,000 shares.

AT&T HAS ASKED THE FCC *for permission to revise TV transmission rates, reducing charges for contract service over its 100,000 miles of TV routes, and increasing rates for occasional service.*

RCA GLOBAL COMMUNICATIONS HAS extended International Datel service to Belgium, international New York–Belgium Datel rates being set at $4 per minute.

GT&E HAS SET NEW RECORDS *for telephone revenues ($1,638,803,000), manufacturing revenues ($1,492,083,000), net income ($206,306,000), and earnings per share ($1.82) for the first nine months for 1972.*

TRT TELECOMMUNICATIONS CORPORATION IS the new name of the old Tropical Radio Company which now serves Europe as well as Central and South America and the Carribbean.

CHICAGO COMMUNICATIONS SERVICE HAS *received an FCC license to operate as a common carrier multipoint distribution station for TV and data transmission via microwave using 2154.75 and 2150.25 MHz.*

GLOBAL COMMUNICATIONS LIMITED PLANS to spend $7 million to start a third Canadian television network with three VHF and three UHF stations.

BRITCO HAS ACQUIRED *Telephone Equipment Corporation in exchange for 33,054 shares of Britco stock and ordered $1.5 million worth of communications equipment from San Antonio Tel.*

DATRAN AND NIPPON ELECTRIC ARE reported near agreement on a $100 million deal underwritten by 11 Japanese banks by which NEC would supply equipment for the Datran microwave network.

Interconnect Companies File Against AT&T

Five independent interconnect telephone equipment companies have filed an antitrust class action suit against AT&T in the United States District Court in San Antonio, Texas.

Named as defendants in the legal action are the parent firm of AT&T and all of its operating subsidiaries in the United States, including Southwestern Bell, Southern Bell, South Central Bell, Southern New England Telephone, and Western Electric.

Filing as plaintiffs in the case representing independent telephone companies are: San Antonio Telephone Company, San Antonio, Texas; Gulf Telephone & Electronics, Houston, Texas; Northeastern Telephone Company, Milford, Connecticut; El Paso Telephone Company, El Paso, Texas; and Gulf States Telephone Company, Mobile, Alabama.

The five plaintiffs are independent firms who sell a wide variety of consumer and commercial phone equipment—telephone instruments as well as switching units—which can interconnect with existing Bell System lines and service.

The antitrust suit alleges that the Bell System has violated the Sherman Act in maintaining an illegal monopoly with AT&T's control over the equipment portion of the industry. Plaintiffs are asking for action against AT&T to require divestiture of the station equipment business, an end of present restraint-of-trade practices and consideration of the estimated $25,000,000 in damages caused by this illegal monopoly.

In this issue . . .

A Guide to Interconnect

SEE PAGE 17

Arcata Acquires Voycall Manufacturing Facility

Arcata National is set to acquire Voycall, in a deal whereby the Oakland (California) manufacturer of telephone and interoffice communications systems will become a wholly-owned subsidiary of Arcata. Voycall had sales of $1.4 million last year and expects sales of $3 million this year.

Expect 20,000 at Anaheim Fall Joint

Harvard University's Anthony Oettinger, chairman of the Computer Science and Engineering Board of the National Academy of Sciences, will be the featured luncheon speaker at Fall Joint, speaking on "Information Technologies and Public Policy."

The user-oriented Fall Joint Computer Conference to be held December 5-7 in Southern California's beautiful Anaheim Convention Center will offer the most comprehensive program ever put together by AFIPS. There will be 43 separate sessions plus several seminars . . . and over half of the conference program will focus on user applications.

Of special interest will be four special full-day applications oriented seminars on "Computers in Banking and the Electronic Payments Mechanism," "Computers in Manufacturing," "Computers in Medicine" and "Health Care and Computers in Information Data Centers." These seminars, consisting of four sessions each, are being aimed specifically at non-computer design specialists who are in need of workable, practical answers in such areas as: trends computer technology is taking in his area of interest; application of computer knowhow to solving his problems; solutions to problems that arise in various system configurations.

AFIPS officials hope that some 20,000 computer and communications specialists will attend and, in between inevitable conversations about "what's going-to-happen-to-IBM", will find time to visit the more than 115 exhibit booths displaying computer hardware, software and related services.

Continental Gets Mid-Continent Tel

Mid-Continent Tel has agreed to a merger with Continental Tel with one share of Mid-Continent stock exchanged for 1.1 shares of Continental stock.

The combined company, which would continue the name of Continental Telephone Corporation, would be the second largest independent telephone company, with total assets exceeding $1,805,000.00.

Both companies have been achieving record revenues and earnings. Continental reported earnings of $1.47 per share for the 12 months ended June 30, 1972, and Mid-Continent has just announced that it earned $1.44 per share in the 12-month period ended September 30, 1972.

Charles Wohlstetter and J. P. Maguire would continue as chairman and president of Continental, respectively, and Weldon Case, now president of Mid-Continent, would become vice-chairman of Continental.

Shareholders of both companies will be asked to vote on the merger early next year.

WUI Sells Earth Station to China

Western Union International has sold a satellite earth station to the People's Republic of China. In making the announcement, Ed Gallagher, president of the international record communications carrier, said that WUI will furnish a 98-foot antenna satellite earth station terminal to be installed in the vicinity of Peking.

The contract was signed in Peking recently by representatives of the China National Machinery Import and Export Corporation representing the People's Republic of China, and Tom Greenish, executive vice president of WUI.

In this issue . . .

Lift-Out on Data Communications

SEE PAGE 31

Communications Set for Final Apollo Shot

Apollo 17, last of the Apollo series of moon shots, is set for launch from Cape Kennedy on December 6 and the most sophisticated communications system yet will be set to relay the words and television images of Astronauts Gene Cernan and Jack Schmitt (first geologist to land on the moon) from the lunar surface . . . and of Astronaut Ron Evans from the command module. Cernan and Schmitt will touch down on December 11 in the Taurus-Littrow area of the Moon for three days of exploration.

RCA Communications Set for Disney World

RCA Corporation is going to showcase communications progress . . . at Disney World. RCA has agreed to sponsor a multi-million dollar space voyage attraction described as "the most exciting new project' being developed in the complex's Magic Kingdom theme park.

E. Cardon Walker, president of Walt Disney Productions, called the RCA-sponsored attraction the most exciting new project being developed in the Magic Kingdom theme park, and predicted that it will be visited by five million people annually.

The attraction will take visitors on a simulated space journey, trace the history of communications, and depict the increasingly important role of electronics in the home.

"The final portion of the attraction then will dramatize the impact of this progress upon our lives by presenting a simulation of the home information center of the future," says RCA Vice President Jim Johnson. The home information centers will employ cable television, video player systems and data communication technology to offer such services as shopping and banking by TV, special educational programming and instantaneous access to reference information ranging from gourmet recipes to complex technical data.

Construction on the attraction is slated to begin within a few weeks, with completion slated for spring, 1974.

STRATCOM Studies Digital Transmission for DCA

The Defense Communications Agency is sponsoring . . . and the Strategic Communications Command is undertaking . . . a study to evaluate the replacement of analog (audio) transmission with digital transmission in line-of-sight communications overseas.

The test bed for the system, which includes two terminals, a repeater station and peripheral equipment, will be located at STRATCOM headquarters in Fort Huachuca, Arizona.

The Army feels that digital transmission through a microwave network will reduce the distortion that tends to accumulate on analog circuits. Other advantages seen include transmission channel sharing of voice, message and data traffic.

A similar program for tropospheric-scatter transmission is scheduled to be investigated.

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Rochester Tel Plans Telephone Net for Xerox

One of the nation's most modern and extensive business telephone systems will be designed and installed for Xerox Corporation in Rochester by Rochester Telephone Corporation within the next two years.

A recently concluded agreement between the two companies is believed to be the largest single telephone contract ever negotiated in upstate New York. Under its terms Rochester Telephone will install Centrex equipment in a downtown central office building to serve Xerox Square. Rochester Tel will build a new central office building near the Joseph Wilson Center for Technology in Webster, New York, where the principal Xerox research, engineering and manufacturing facilities are located. The office will serve many hundreds of other telephone customers in the Webster area, but because of Xerox need for more sophisticated switching equipment, the equipment is being designed with the Xerox multiple and expanding needs in mind.

In addition to standard Centrex features . . . direct inward dialing, automatic transfer of calls, and consultation calls . . . the Xerox system will include automatic route-advance for toll calls. On direct-dialed calls, the equipment will select the first available line in the WATS system, a lower-cost special network leased to high-volume users. If the desired WATS band is in use, the equipment will hunt for other WATS lines through which the dialed number may be reached. If all WATS bands are busy, the call will be routed automatically through the regular long-distance network.

One of the advantages the new system will offer Xerox is the use of Centrex lines at its corporate computer center in Webster. The computers now require separate leased lines, at extra cost to the company.

The new system will make possible automatic allocation of long-distance charges to the specific caller. It is also expected to provide greater reliability through substitution of electronic switching for an electro-mechanical system.

Completion of the entire system is planned for late 1974, depending on availability of equipment. By that time, Rochester Tel engineers estimate Xerox will have 6,000 Centrex users at its Wilson Center and 2,000 at Xerox Square.

Approximately 1,600 phones will be in service at two other Monroe County Xerox facilities, in Henrietta and in Pittsford. For inter-site calling, a tandem-switching device has been proposed for the downtown central office building. Tie lines would be connected to the device.

TCA Names Corporate Officers for 1972-73

The Telecommunications Association has elected the following officers for the 1972-73 year: Don Shearer (Aerojet—General), president; Lucky Marr (California State Automobile Association), vice-president; Steve Ernst (Bank of America), secretary; Dick Lyddon (Union Bank), treasurer; Chuck Buxton (Bechtel), Director; George Lombardo (Trans-America Corporation), director; and Nick Long (C. F. Braun) Director.

In addition to these TCA corporate officers, Hank Kramer (Montgomery Ward) was elected as a director and president of the Northern Chapter of TCA. And Dick Reynolds (Flying Tiger Lines), was elected a director and president of the Southern Chapter.

McDonnell Douglas Installs Video Terminals for Management Info

Instant access to production status information is provided by this video display terminal at the McDonnell Douglas jet aircraft assembly operation in St. Louis. The terminals . . . both CRT and hard-copy . . . are installed at 141 local and remote points, forming the main communications links in the company's Information Management System.

McDonnell Douglas has installed more than 180 GTE Information Systems video and hard copy terminals at its St. Louis manufacturing facility and elsewhere as part of a data communications network designed to speed inquiry of aircraft production status reports.

The equipment, valued at approximately $500,000, has been installed at 141 locations to form the main communications links in the Information Management System serving McDonnell Aircraft Company, McDonnell Douglas Automation Company and McDonnell Douglas Astronautics Company.

Connected to one of McDonnell Douglas Automation Company's IBM Model 195 central computers, the terminals and associated communications equipment provide instant up-to-date status reports on all open production work orders streaming through the aircraft shop . . . either on the face of a CRT or in hard copy form. This enables production supervisors to monitor the progress of every job in the shop, matching the computerized output to a written work order that specifies the tasks to be completed.

McDonnell Douglas also uses the on-line inquiry system to furnish production status reports on the company's Numerical Control System, enabling terminal operators to track the work being performed by automated machine tools in designing and manufacturing the various aircraft and space vehicles.

The equipment currently installed includes 120 Videomaster 7700 cluster display terminals (12 controllers with 10 CRT's on each unit); 55 Novar 5-40 Mod II Data Communication terminals for hard copy output; nine Videomaster 7100 stand-alone remote display terminals; six impact printers; and 10 1200 bit-per-second data pumps.

GT&E Forms GTE Satellite

General Telephone & Electronics has formed a new subsidiary called GTE Satellite Corporation and has filed modified applications with the FCC to construct and operate an expanded domestic satellite system, replacing a proposal initially filed in December, 1970 by five GTE telephone operating companies.

The proposed system is being expanded to include a multi-purpose satellite earth station in Hawaii in addition to those planned for California, Florida, Indiana, and Pennsylvania.

The system's five earth stations would be interconnected through 10 transponders leased in a 12-channel satellite proposed by Hughes Aircraft Company with "back-up" channels on a second 12-channel Hughes satellite. The 10 leased channels would provide the system with a total capacity of either 12,000 one-way voice-grade circuits, 10 television circuits, or various combinations of the two circuit types.

In its applications, GTE Satellite Corporation said the satellite system would be operational 24 months after receipt of FCC approval. The total gross investment for the system is estimated at more than $52 million, and annual operating costs would amount to approximately $27 million.

The earth stations would be located at Triunfo Pass in California, approximately 40 miles west of downtown Los Angeles; Homosassa, Florida, about 70 miles north of Tampa; Pupukea, Hawaii, approximately 30 miles north of Honolulu; Metamora, Indiana, some 60 miles southeast of Indianapolis; and Indiantown Gap, Pennsylvania, about 40 miles northeast of Harrisburg. The locations were established to serve major geographical areas selected on the basis of current traffic volumes and anticipated future growth.

The stations would be constructed in or near the operating territories of the five GTE subsidiaries which filed the initial system proposal.

TelePrompTer Offers Sports to LI Cable TV

TelePrompTer recently initiated subscription television service to 25,000 subscribers on Long Island with a sports package which includes offering home games of the New York Nets of the American Basketball Association and the Islanders of the National Hockey League to Long Island cable TV systems.

Domestic TV and Radio Sales Are UP

United States manufacturer television sales to dealers were higher in September 1972 than in any month on record according to the Electronics Industries Association. Sales of color television sets to dealers, the industry's major product, reached a record 954,-147 sets, up 27.8 percent over the 746,617 sets sold in September 1971. Color TV sales through the third quarter of 1972 were up 24.7 percent over sales through the first nine months, of 1971.

Monochrome set sales to dealers were up 16.2 percent in September 1972 over sales in September 1971. Total television set sales to dealers in September 1972 were a record 1,584,-302 sets, up 22.9 percent over the 1,288,725 sets sold in September 1971. Year-to-date television set sales, both monochrome and color, were up 17.8 percent from sales in the same period last year.

Both home and auto radio sales were up in September 1972 over sales in the same month last year. And total radio sales are up four percent for the first nine months of the year.

Univac and Mitsubishi Join in Air Control Bid

Univac and Japan's Mitsubishi Electric are joining forces in a 15 billion yen ($49 million) bid for a Japanese government contract to provide for a comprehensive air traffic control system for Japan, including eight radar stations and automated systems at the Tokyo and Osaka international airports. IBM, Nippon Electric, and Tokyo Shibaura Electric are also bidding.

Hot Line

Important communications news from Washington

MCI-NORTH CENTRAL STATES applications for specialized common-carrier service between Minneapolis and Chicago, via St. Paul, Madison, and Milwaukee, have been granted by the FCC. Estimated cost, including multiplex equipment, is $3,254,549.

FCC GRANTS LICENSE TO CHICAGO *Communications Service as a common-carrier Multipoint Distribution Station (MDS) for television and data information via micro-wave, with authorization to operate a shared-time, private microwave TV station in the United States. The FCC grant covers a radius of approximately 30 miles from the center of Chicago.*

REPRESENTATIVE ROBERT TIERNAN (Democrat—Rhode Island) introduced H.R. 17113 in the House of Representatives to make aid available to cable systems to wire rural and sparsely populated areas. Since Congress adjourned six days later, Tiernan plans to reintroduce the bill next session. It will be referred to the House Committee on Interstate and Foreign Commerce and handled by the Communications and Power Subcommittee of which Tiernan is a member. The bill, which amends Part I Title III of the Communications Act, allows the Secretary of Housing and Urban Development to make loans to cable systems or proposed cable systems which "can reasonably be expected to pass less than a system average of 60 potential consumers per linear mile during its first five years of operation." The loans could be used for the improvement, expansion, or acquisition of systems as well as the building of new plants or for refinancing the present debt up to 40 percent of the amount of the total loan.

OVERSEAS TRAFFIC REPORTS *of international common carriers, submitted under Section 43.61 of FCC rules, are to be made available for public inspection under terms of a ruling by Bernard Strassburg, Chief of the Common Carrier Bureau. Section 43.61 requires these carriers to submit two reports annually, containing detailed information about overseas traffic—one for the first six months of the year, and the second for the entire year.*

PART 76, SUBPART B OF CABLE TV RULES (procedures) has been amended by the FCC to emphasize that where the State has authority over cable TV, it must be served with copies of the application for certificate of compliance even where that authority is in dispute. In addition to emphasizing the procedural point about serving both authorities with copies of the application (the first part of Section 76.13) the Commission amended the second part of that rule to "make it clear that," unless either the state or local body makes a copy of the application for certificate of compliance available for public inspection in the community of the system, the applicant will provide for public inspection of the application in its community.

FCC CHAIRMAN DEAN BURCH *has informed Clay Whitehead, director, Office of Telecommunications Policy, that the commission has no objections to the use of guidelines developed by the Interdepartment Radio Advisory Committee (IRAC) for determining when common carriers are required to obtain commission radio authorization even though government frequencies are to be used.*

A MAJOR REVISION IN RATES for microwave service, filed by American Television Relay, Incorporated for delivery of the signals of four Los Angeles, independent TV stations to cable TV customers in California, Arizona, New Mexico, and Texas, has been suspended for three months and designated for hearing by the FCC. The revisions, which would reduce rates to three geographical points and increase them to 16 other points served by ATR, were to become effective October 15, 1972. The commission, stating that substantial questions are raised about the lawfulness of the revised tariffs, said that the "increases involved are substantial both collectively and individually." It said that the increases are based in part "on novel rate-making theories" that depart from cost of service and vary the charges to cable TV customers according to the population served without regard to the extent to which cable TV customers may penetrate the market in these areas.

FAA AWARDS McDONNELL DOUGLAS *Electronics division a $194,000 contract to study the number of ground stations needed for a nationwide network of time-frequency collision-avoidance systems for air-traffic control.*

PARTICIPATION BY COMSAT in the construction of an INTELSAT IV (F-7) satellite, to serve the Pacific region as a "spare" for the present INTELSAT IV (F-4) satellite, has been conditionally approved by the FCC. In a separate action, the commission approved the launch, positioning, and testing of the spare INTELSAT IV satellite. The satellite is to be positioned at 179 degrees East Longitude. The commission said it was approving Comsat participation in construction of the second INTELSAT IV satellite because INTELSAT III (F-4), the present spare satellite in the Pacific, has become highly unreliable during periods when the sun is eclipsed, and with the expected increase of Pacific satellite traffic in the near future, INTELSAT III may not provide complete back-up capability to the existing INTELSAT IV.

General Electric Introduces New Solid-State FM Two-Way Radio

A new compact, solid-state FM two-way radio design has been unveiled by General Electric. The line will be known as "MASTR II", an entirely new design incorporating the latest in monolithic and hybrid circuitry, ceramic capacitors, silicon transistors, and monolithic crystal filters.

The new design is considerably smaller than GE's earlier MASTR equipment and has a new style and new circuit configurations. It is available with 50 and 100 watts RF output in low band; 35, 65, and 110 watts in high band; and 40 watts UHF. Eight-frequency operation is an off-the-shelf option, utilizing integrated-circuit oscillator modules in either ±0.0002-percent or ±0.0005-percent frequency tolerances.

The basic radio is 2½ inches high, 11¾ inches wide, and 18¾ inches long. Both the control head and speaker have safety-release, "breakaway" mounting features.

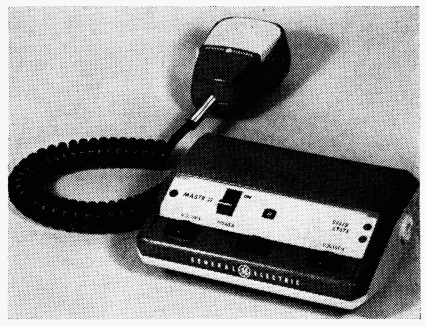
The line offers a powerful audio system, with 12 watts delivered at the speaker with less than three-percent distortion. With a flick of a switch, the control head turns the mobile radio into a 12-watt public-address system. This is done with a "hailer" option for which space is built in. Incoming radio calls can be switched to an external speaker.

The radios are designed to operate in temperature environments from −40°F to +150°F.

The totally enclosed unit locks into a separate mounting frame with concealed sliding-bolt action, providing greater security than swing-arm locking designs, according to GE. Top and bottom drip-proof covers remain in place when the unit is removed from the frame, giving complete circuit protection during transit and servicing.

Other features include light-emitting diodes which eliminate lamps, single-conversion receiver, squelch-tail elimination, and positive/negative ground capability with no converters. An optional feature on the control head is a "channel busy light", a long-life, low-drain light-emitting diode.

For receiver channel scanning, the equipment has a "Priority Search Lock Monitor" option. A Channel Guard tone-squelch option with a new "Versatone" plug-in tone network minimizes the nuisance of cochannel interference.



GE's new MASTR II FM two-way radio is a totally new design.

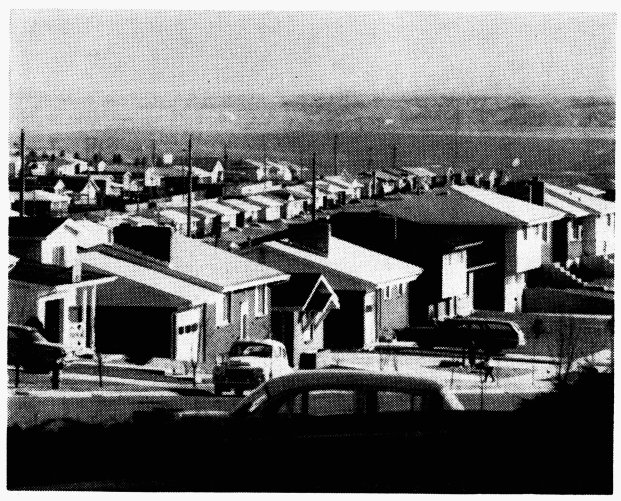
Among other options are fixed squelch, carrier control timer, low- and high-band noise blankers, and choice of cable lengths for customized installation.

For further information, use the handy Reader Service Card or write *General Electric Communication Systems Division, Section P, Post Office Box 4197, Lynchburg, Virginia 24502.*

For more info circle 231 on Reader Service Card

In the 30's, we created the first of a family of PCM Carriers.

Now we're introducing a whole new generation for the growing 70's.



Pulse code modulation was born in an ITT laboratory. The scientist was Alec Reeves. The year was 1937. And from then on, telecommunications would never be the same. The industry had taken a giant leap into the future.

Because we started it all, we have always been a leader in the field. For example:

Most recently, we introduced the economical T124S—the most up-to-date carrier available with 24 lines of subscriber service over a two-cable pair.

Now comes the ITT T324 PCM Trunk Cable Carrier system with nearly 40 years of experience and technological skills built in.

The T324 is, to begin with, 25% smaller than its predecessor the T124. It is also smaller in size than most other comparable PCM Carrier equipment.

Power consumption is considerably lower than most PCM equipment available today. It is fully end-to-end compatible with D2.

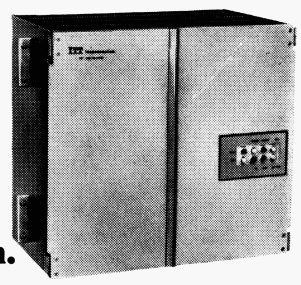
The T324 is a toll grade carrier—not an exchange grade carrier. This means it can link two cities for long distance, rather than just two offices. And at any appreciable distance from your central office, it offers substantial savings over cable. We can prove that to you.

Other features: system design is all solid-state, employing the latest advances in integrated circuitry. Troubleshooting is reduced by card-mounted circuits.

Twenty-four voice channels are provided over two-cable pairs. Light emitting diodes indicate busy trunk condition. A test and alignment unit simplifies installation and maintenance.

Put our long experience to work. For complete details on the T324, write or phone: Director of Marketing, ITT Telecommunications, Transmission Department, 2912 Wake Forest Road, Raleigh, North Carolina 27611. Telephone: (919) 828-4441.

In Canada contact: ITT Communications, 175 Dawson Road, Guelph, Ontario, Canada. Telephone: (519) 821-2000.



The new T324. A new generation.

Telecommunications Division ITT

Circle 1 on Reader Service Card

COMMUNICATIONS news

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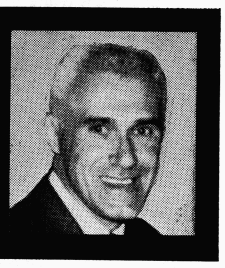
Point of view . . .



An observation by CN Publisher Bruce Howat

Nearly two thousand years ago, when the very small group of early Christians were proving to be a very bothersome thorn in the sides of both the Jews and the Romans, a wise old Jewish lawyer named Gameliel stood up in the council and gave some sound advice, saying, in effect: "Let these men alone, for if this work be of men it will come to naught; but if it be of God, you cannot stop it."

Years later Victor Hugo put a similar thought this way: "No army can withstand the strength of an idea whose time has come."

In this issue we are devoting a special section to what may be "an idea whose time has come" . . . a 12-page "Guide to the Interconnect Market" which begins on page 17.

If owning or leasing one's own telephone system is impractical, economic considerations and/or service considerations will prove it so; if, on the other hand, owning or leasing one's own system is a viable alternative to using telco-furnished equipment, no force *should* stop it with unfair competition . . . and no force *can* stop it, unless thru contrived restrictions!

In our "Guide" we examine all of the pros and cons of "going interconnect" . . . and we hope these brief articles prove helpful to all. But our basic hope is that everyone involved in decisions affecting interconnect development . . . especially the FCC commissioners and the state regulatory groups . . . will deal *fairly* with both sides: the *telephone companies* which have provided and are providing Americans the world's finest telephone service and which should be allowed to meet this competition with any effort fair to all telephone users . . . and the *interconnect suppliers* who are offering some very fine communications systems and who have stimulated the development of improved systems and service by *both* sides.

Elsewhere on this page our friend Grant Berglund takes a Gameliel-like stance on interconnect (and expresses a feeling we share) when he says: "The direction . . . is irreversible . . . so let us be pragmatic and get on with the business and opportunities at hand."

✶ ✶ ✶

Speaking again of Gameliel, how right he was! This month, nearly two thousand years later, no corner of the world is untouched by that "One Solitary Life" and all over the world millions of Christians (and millions who aren't) will again be refreshed by the message of joy and hope and love that is "Christmas." We of CN share with you, our readers, the warmest of Christmas greetings and hopes for the brightest of new years.

They say . . .

Quotable quotes from notable communications industry people

Be Done with the Turmoil

. . . says Berglund's Ralph G. Berglund

■ In 1968, the late Cole Armstrong, Deputy Director of Telecommunication Management in OTM, said there existed then a "turmoil in telecommunications which is stifling growth, impeding the prompt and effective use of the technology in the national and public interest, inhibiting industry from doing any meaningful long-range planning, and, above all, frustrating what could undoubtedly be a communications explosion in the real sense of the term". Not only do we still have many of the issues we had four years ago; Armstrong's description of the industry at that time is also still valid today . . . a *turmoil in telecommunications.*

If the potential is, generically, that of better communications at lower cost, then the problems are, generically, those factors and proceedings restraining us from full exploitation of the new alternatives, or jeopardizing their viability. Thus far the principal aspect of such restraint has been the seemingly interminable proceedings on interconnection. A succinct, elementary and so obviously correct policy position by the FCC, now four years old, has yet to have its full fruits realized.

Right or wrong—and I personally believe right—the industry has taken an unprecedented direction in the past four years. Unprecedented and, I believe, irreversible. In the long view I believe this direction will, on balance, be productive for the industry and the user community. Let us, then, be pragmatic and get on with the business and opportunities at hand; let us be done with turmoil in telecommunications!

We'll All Be in Zugzwang

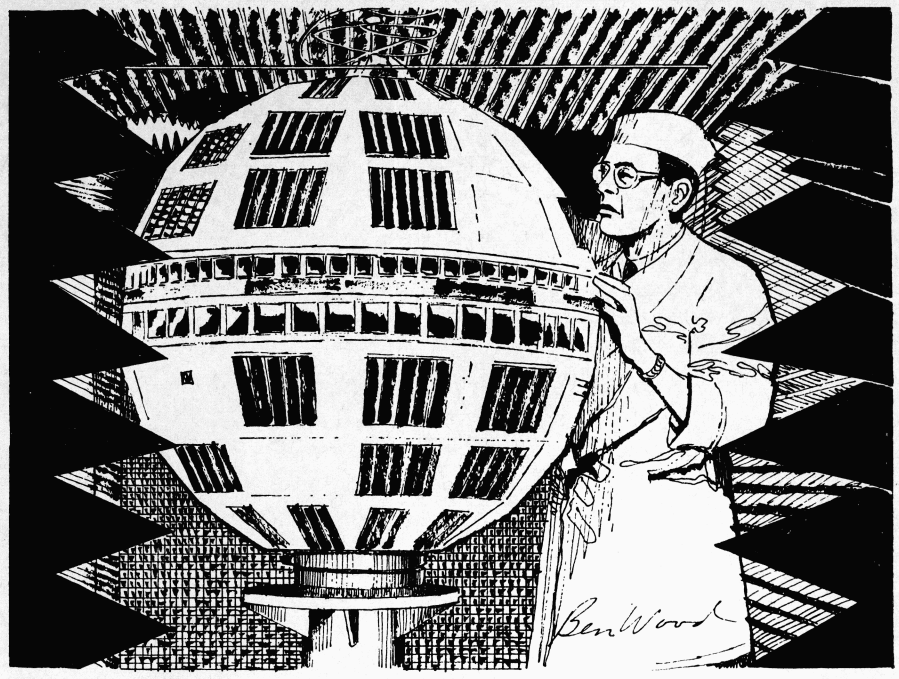
. . . says NARUC President Francis Riordan

■ In chess, a player is said to be "in Zugzwang" when whatever move he makes can only get him into more trouble than he is already in. Nothing he can do can improve his situation.

In a very real sense, it is the mission of the men and women who regulate public utilities in America to try and see that the consumer does NOT find himself in Zugzwang.

"I'm not even going to hang mine up. According to this the chances of there being a Santa Claus are 297,103 to one!"

Great Moments in Communication



IT IS JULY, 1962 and at Bell Laboratories in New Jersey Bell Labs Engineer Charles Haas inspects a model of the Telstar satellite in a room lined with pyramids of foam plastic that absorb radio energy. The chamber simulates the radio environment of space so engineers could test the satellite's antennas. The $80 million Telstar project, designed, built and paid for by the Bell System, is expected to make a significant contribution towards satellite communications technology.

Those of us in the regulatory community believe that the universal availability of reasonably priced telephone service is a key part of what some people call "The American Way of Life."

A universal telephone system in this country at rates the average American can afford may soon become a thing of the past while business and other affluent users continue to enjoy improved services at reduced or minimal prices because of the FCC rulings that opened the field of data transmission to unrestricted competition, and liberalized previous policy regarding interconnection.

If spiraling rates were to deprive many American householders of residential telephone service, then the cost of maintaining the overall network will have to fall somewhere else.

And where else is there but business users?

If that extreme situation were to occur, then surely we should, all of us, consumer and businessman alike, be in Zugzwang as far as telephone usage is concerned. And Zugzwang, as Boris Spassky discovered this summer, is a bad place to be.

Benefits Flow from FCC

. . . says Former Commissioner Ken Cox

■ I think all the ferment about interconnection has not only stimulated the development of innovative equipment by non-telephone manufacturers, but has also forced AT&T to respond more effectively to the demands of its customers. It is selling its own terminals more aggressively and imaginatively in the face of competition. It has consolidated PBX development in its Denver plant, bringing together representatives of its research, manufacturing and marketing organizations—with the result that it has been able to introduce new designs in as little as eighteen months, which is far short of the time formerly required. All of this, I think, represents substantial benefits for the public, which flow directly from the FCC's regulatory activities.

200 Now Intending to Buy

. . . says Informatics VP Francis V. Wagner

■ The market for custom software and software products has also been stimulated by the growing demand for computerized communications systems. Three or four years ago there were perhaps 20 companies who either had or were studying computer controlled communications and message-switching systems. Today, there must be nearly 50 companies who have installed them. And there are maybe 100 to 200 intending to buy within the next two to three years.

Metric System Is Needed

. . . says NA Rockwell's W. F. Rockwell

■ America's conversion to the metric system of measurement is necessary for this country to compete successfully in international trade.

Ninety per cent of the world's population, conducting three-quarters of its trade, use the metric system. That 90 per cent is buying and selling to each other, and collectively they're increasingly cool to the products of the 10 per cent who don't use the same system.

A National Metric Conversion Board will be created to devise within 18 months a national plan for a ten year progression into the full metric status.

Although the changeover will be difficult and costly, it will pick up speed and be completed well before the end of a ten year conversion period.

This country is not only moving into the metric system, the metric system is moving into us. Recent surveys show that 11 per cent of United States manufacturers now use the metric system in some way, and 70 per cent feel that conversion would be in this country's best interest.

End the Football Blackout

. . . says FCC Chairman Dean Burch

■ It *is* our responsibility . . . "to promote the larger and more effective use of radio" . . . which obviously now means television as well . . . "in the public interest." This is the clear mandate of the Communications Act and, in line with this mandate, the Commission is vitally interested in its licensees having access to the broadest possible range of programing, and providing such programing to the largest possible public. Certainly NFL games, wherever they are played, rank high on everybody's hit parade. . . . The Commission supports the enactment of two bills which would essentially end local television blackouts of National Football League home games.

Now your busiest overseas telex number is 1.

Introducing Uni-Code

Now your busiest overseas telex number is 1.

The ultimate in simplified telex selection. One digit to reach your business correspondents anywhere in the world. One digit. That's all.

Instead of calling the area code plus overseas number: **Uni-Code.** Instead of selecting multi-letter codes: **Uni-Code.** Instead of selecting any more than one digit: **Uni-Code.**

With RCA Glōbcom's new Uni-Codes, you

select a single number to reach a subscriber say, in Germany, Japan or the United Kingdom. Or your busiest offices anywhere in the world with only one tap of a teleprinter key.
Short and easy. Nine times shorter than most telex numbers. Ten times shorter than a long-distance telephone number. Twice as easy as selecting a Mini-Code.

Domestic telex or TWX subscribers use one-digit Uni-Codes as well. Simply dial the RCA Glōbcom access code. Then one number puts you in touch with your most frequently called overseas correspondents.

Uni-Code. A number as easy to remember as it is to select. Now your busiest overseas telex number is 1, your next busiest 2, your next is 3,...

To receive your Uni-Code number assignments (Subscribers already using Mini-Codes are being contacted and given their new Uni-Codes automatically) or for more information about Uni-Codes, call your RCA Glōbcom representative. Or, write to Manager, Services Marketing, RCA Global Communications, Inc., 60 Broad Street, N.Y. 10004.

RCA Global Communications

Circle 2 on Reader Service Card

New Telephone Answering Unit Can Be Programmed in Advance

A new electronic telephone answering system that can be programmed in advance to set the time allowed for incoming messages is now available.

Called the Ansafone 640, the machine can be preset to limit incoming callers to 30 seconds of recording or to permit a continuous message of up to 30 minutes. When the unit is in the continuous mode, an automatic voice operated relay enables the caller to pause for up to 12 seconds without losing the line.

During off hours the unit can accommodate more lengthy messages such as out-of-town reports occasioned by time differences. The outgoing message cartridge, with a capacity for an announcement of from 15 seconds to 3 minutes, is plugged inside the unit. The user lifts the hinged cover, plugs in the cartridge, connects a small hand-held microphone and records the outgoing message. An exclusive feature is the automatic replay of the outgoing message each time the machine is set to receive incoming calls. This assures the users that the correct message is in the unit. Erasure of the message can be accomplished by recording a new message over the old, or new cartridges with different messages can be stored and substituted when needed.

The incoming message controls, which are positioned within easy reach on the outside, include a switch for on-off and volume. Signal lights indicate when the machine is on and when a message is being recorded.

In operation, when a call comes in, it is automatically answered, the message given and the recording begun in one continuous and automatic cycle. The user may screen the calls and answer selectively those that he deems most important.

Reproduction of the play-back cassette is said to offer outstanding sound quality with signal-to-noise ratios of 35-40 dB.

The new Ansafone 640 is equipped with an incoming message tape counter that tells the user at a glance the volume of incoming calls while he was away from his phone. It also has a fast forward and fast rewind rate of 20 to 1 and an erase button. The 640 uses a standard C-60 cassette which can be played back on the machine or on a separate recorder.

The new Ansafone 640 permits the user to vary the time allowed for incoming messages from a minimum of 30 seconds to a maximum of 30 minutes, guarding against prolonged telephone use during peak hours.

For more information, use the handy Reader Service Card in this issue or write: *Dictaphone Corporation, 120 Old Post Road, Rye, New York 10580.*

For more info circle 111 on Reader Service Card

EIA Offers Report on Mission to USSR-Poland

A report covering the recent electronic communications trade mission to the Soviet Union and Poland has been prepared by Mission Director John Sodolski, staff vice president of the Communications and Electronics Division of the Electronic Industries Association.

The report offers comments on the state-of-the-art of communications technology, covers highlights of the trade mission, and lists key government agencies in the two countries which have responsibility for the development and purchase of communications equipment.

In a summary to the 25-page report, Sodolski says: "Based on information developed during our visit, there appears to be an immense market for communications equipment in the Soviet Union, Poland, and probably other eastern European countries. Both the Soviets and the Poles were far freer in revealing their requirements and problems than we had expected. Whether we are able to avail ourselves of those opportunities depends very much on how the United States government handles its export control program, and our own reaction to competition from foreign firms. The climate for sale of American equipment in the east bloc nations appears to be excellent. If our reception is any indication, Soviet and Polish officials are more than eager to do business with American firms. The question is, are American government officials equally eager for American firms to do business with the USSR and Poland in advanced technology areas such as communications equipment?"

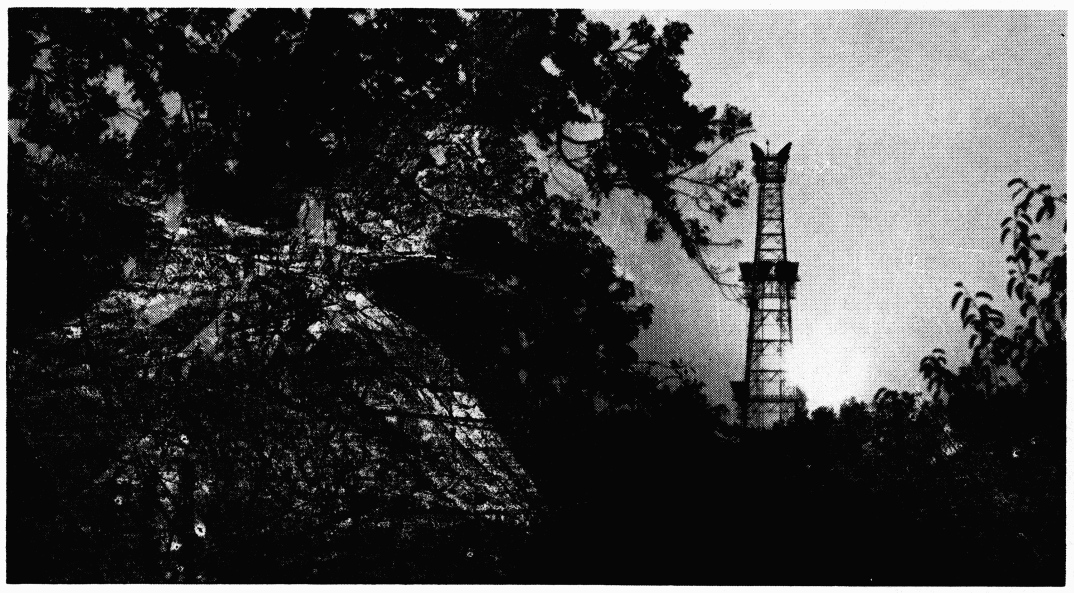
Representatives of 13 electronic communications equipment manufacturing firms participated in the mission (see story, November *Communications News*).

To obtain a free copy of the report, use the handy Reader Service Card in this issue or write to *Electronic Industries Association, 2001 Eye Street NW, Washington, D.C.*

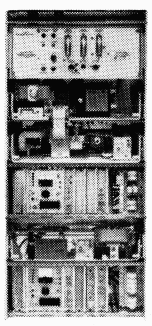
For more info circle 112 on Reader Service Card

Interchangeability without realignment

Collins 09E-1 series radio



Complete interchangeability of system modules. Now you can change out or interchange modules without retuning, realigning, or even tweaking.



How come? With Collins' built-in delay equalizers, realignment is suddenly obsolete. An extra step you never need take again. That adds a new dimension to interchangeability. But that's not all. Everything about this radio is the very latest state-of-the-art. Reliability, performance, ease of maintenance—superb. Sophistication, precision—tops. It's compact. Two transmitters and two receivers plus power supplies fit in one standard bay. And it's solid-state to diminish power consumption and further improve reliability. Plus there's a pre-alarm to warn you of possible trouble before it happens.

And finally, an important intangible. The name Collins. A name you know. A name you can depend on.

Get in touch with Collins, Dept. 400, Dallas, Texas 75207. Phone: (214) 235-9511.

COLLINS

Circle 3 on Reader Service Card

Litcom Introduces Computerized System for Interconnect Market

The Litcom division of Litton Industries has just introduced a new computerized telephone system for the interconnect market.

The new system is a four-wire electronic private automatic branch exchange which permits private business telephone users to automate phone traffic, including toll calls, and change system functions without rewiring after initial installation.

The new PABX system is expected to save users up to 30 percent annually in toll and related costs. The system, which links company facilities to the public telephone system, automatically routes calls over the least costly lines available and programs the most efficient distribution of phone traffic so that rental of long distance lines can be held to a minimum.

The automated PABX also eliminates the need for more than one operator to handle toll calls placed through the computer-controlled system.

The system includes a small, desk-size operator console and adjacent cabinets which house a minicomputer and electronic switching circuitry. The minicomputer, which can easily be reprogrammed without disruption of service, controls all switching functions and automatically assigns calling priorities. The PABX system prints out a continuing statement of subscriber toll call activity, and even offers verbal instructions on how to make a long distance call.

The new system is expected to be the most useful to multi-location companies with high levels of long distance traffic.

The system uses Time Division Multiplexing, a digital transmission technique which eliminates electromechanically switched direct wire connections between distant phones and allows many conversations to be carried simultaneously over a single wire.

For complete information, use the handy Reader Service Card in this issue or write *Litcom Division, Litton Industries, 111 East Wacker Drive, Chicago. Illinois 60601.*

For more info circle 113 on Reader Service Card

This computerized four-wire electronic private automatic branch exchange system has been introduced to the telephone interconnect market by Litcom. The compact system automates the handling of local and long distance calls and is expected to save users up to 30 percent annually in toll and related costs. The system is said to be most useful to multi-location companies with high levels of long distance traffic. A simple console keyboard and alphanumeric display provide the interface between the monitoring operator and the computer controlled system.

For the customer who has everything.....

including a ringing telephone

Your telephone subscribers can have any one of our twenty-six **perfect answers** for their ringing telephone. Because there is a Code-A-Phone® automatic answering and recording system for every need.

For example:
Some "Code-A-Phones" simply answer the telephone and repeat a pre-recorded announcement while other models can be used for in-office dictation or reporting from the field. Order taking is another growing use of the "Code-A-Phone" systems. Some "Code-A-Phone" models allow you to use a remote coder to play back messages or to change the recording. And of course, there's our new Memory Phone™ designed for the home and small business office. It's opening a whole new domestic market in automatic telephone answering systems.

So what does it mean to you?
Profits!
Offering your customers the world's most versatile, dependable line of automatic answering and recording systems is the logical addition to any busy telephone. And it's the logical way to expand your profitability. So have a profitable and Merry Christmas . . . with **the perfect answers** from "Code-A-Phone." (Ho - ho - ho!)

For more information call us collect: 503/774-1104

FORD INDUSTRIES, INC.
5001 SE Johnson Creek Blvd., Portland, Oregon 97206

® Code-A-Phone is a registered trademark of Ford Industries, Inc.
™ Memory Phone is a registered trademark of Ford Industries, Inc.

Circle 4 on Reader Service Card

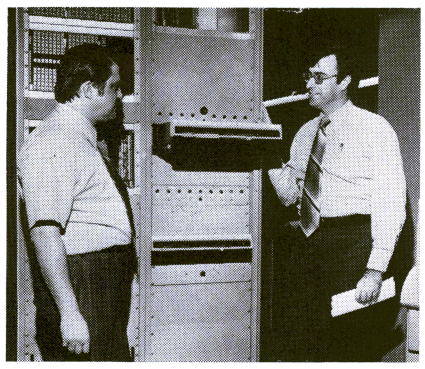
Fully-Automatic Mini Computer Telex Exchange Is Introduced

The first of a fully automatic mini-computer-based family of Telex exchanges, designed to replace electro-mechanical systems in one-tenth the space, is now available.

Designated the Eltex II, the Frederick Electronics system can handle up to 2016 lines or trunks, and uses dual PDP-11/05 minicomputers manufactured by Digital Equipment as control elements. Either of these two computers can control the whole exchange; the two together form a redundant system to provide continuous service.

Eltex II is designed to function as a concentrator, local exchange, trunk-transit exchange, international gateway exchange, or any of these in combination.

The high-performance Eltex II features software call processing for flexibility in the operation and control of alternate routing, automatic digit addition/deletion/translation, and abbreviated dialing. The system is said to provide greater flexibility of subscriber line types, automatic message accounting for toll recording and traffic logging, multi-line hunting groups, and the ease of configuring these features to particular applications. Codes of up to eight data bits and speeds up to 200 baud are accommodated.



John Wilson, president of Frederick Electronics (left) and Marvin Lekstrum, vice president of Eltex Products, inspect one of the computers in an all-electronic Eltex II exchange capable of servicing up to 2016 lines and trunks. The new exchange employs two PDP-11/05 minicomputers for redundant control, and takes up only ten per cent of the space occupied by standard electromechanical exchanges.

USITA Data Conference Set for Iowa State

The USITA Data Communication Winter Conference, sponsored by Engineering Extension at Iowa State University and the USITA and presented by staff from the department of Electrical Engineering at Iowa State University, will be held February 26-March 9, 1973 at Iowa State University, Ames, Iowa.

Included in the $600 registration fee are all textbooks and educational materials, noon buffets, banquet and transportation between motel and classroom. A block of rooms has been reserved for housing accommodations at the Holiday Inn in Ames.

Class hours will be from 8:30 a.m. to 12:00 and 1:00 to 5:00 p.m. Laboratory sessions are held each day from 1:00 to 2:30 p.m. For additional information concerning the conference contact *Dr. Richard Horton, Data Communication Conference Headquarters, 306 Coover Hall, Iowa State University, Ames, Iowa. 50010.*

Imports and Exports Both Show Increases

Imports and exports in all categories of consumer electronic products showed increases in August 1972, over imports and exports in August 1971, according to the Electronic Industries Association. And eight-month totals also showed dramatic gains.

Total television imports of 657,277 sets in August 1972 were 111.6 percent ahead of the 310,597 sets imported in August 1971. Dollar value was up 108.1 percent . . . to $49,646,458. Total television imports, the industry's major product was up 35.7 percent for the first eight months of 1972 over the same period last year . . . to 4,262,099 sets valued at $323,904,308.

Both home and automobile radio imports were up in August 1972 over imports in the same month last year. Total value of the nearly 282 million imported radios was $25,863,758.

All categories of tape equipment imports were up in August 1972 over imports in the eighth month of 1971.

Exports of all consumer electronic products also recorded increases in August 1972 over August 1971 in both units and dollar value. Thru August, United States firms had exported 78,344 color television sets valued at $26,-451,294 . . . a 130 percent improvement over 1972. Some 124,485 home radios and 357,811 auto radios had been exported, representing $11,771,690 in overseas radio sales.

Fort Worth Fire Department Installs Xerox Printers

The Fort Worth Fire Department has become the first fire-fighting agency in the world to install a new Xerox printed-message capability that assures instantaneous and fully accurate reception of all radio dispatches.

Fire Chief L. R. Himes reports that installation of a Xerox mobile printer system in 26 fire stations in the city and seven command vehicles is now being completed.

The compact mobile printers print radioed messages electrographically on a roll of paper at the rate of 280 words a minute.

Chief Himes says the new Xerox units print the radio dispatches 10 times faster than they could be received verbally and written by hand. Messages can be received at moments when vehicles or stations are unattended or their personnel are busy with other duties.

"Fire location descriptions can be transmitted to appropriate stations and vehicles promptly and with complete accuracy," says Himes, adding, "Apparatus will be dispatched more rapidly than with conventional radio communication and the hard copy messages serve as permanent field records. Also, by being able to dispatch detailed, pertinent information to command vehicles enroute to the scene, we'll see more efficient use made of our resources at the fire."

The new system also utilizes two CRT displays as primary input, along with a central translator, paper tape reader and control module which will govern transmission and specially designed equipment to poll the CRT displays from the central translator.

General Telephone of California Tests Numberless Telephones

Do General Telephone Company of California customers really need their telephone numbers listed on their phone instruments at home?

That's a question the utility is attempting to answer in a research project presently underway in its Bellflower-Norwalk Division.

Two thousand opaque fingerwheels without telephone numbers on them are being installed on residential phones within the division on an installation and/or move to new address basis.

The project will continue for at least 60 days or until the 2,000 new fingerwheels have found their new homes. After a 30-day period, customers involved in the research project will be contacted to determine customer reaction and acceptance. So far customer participation has been favorable.

There could be advantages to both customers and to the phone company in conjunction with the study.

Should it be determined that the numbers are not necessary on the instruments, customers with non-published telephone numbers could benefit. Other customers who do not wish unauthorized persons to run up their phone bills would feel more secure. And customers who place aesthetic value on their telephone instruments may find the new fingerwheel to be more acceptable than clear plastic.

The new fingerwheel might in the future reduce the number of trouble calls coming to General and definitely would save the installer-repairman time on the customers premise during an initial visit. Further savings could occur in clerical and printing equipment operations.

When a visit to the home by an installer-repairman is not necessary to initiate service, General currently mails a gummed-back sticker to the customer. Gummed-back stickers, in time, can be unsightly and the number may become illegible if scribbled upon.

3M. If we don't have what you need, we may just invent it.

If you think we're sticking our necks out to say that, you're right.

But that's exactly what we've been doing for the past several years. We've consciously dedicated a good share of our division's resources to researching telephone problems and developing new solutions.

That's how nearly all 3M telephone products and systems have come about. As specific answers to specific problems. As a result, we've become highly expert at many jobs, both inside and outside plant. Look to 3M for: Splicing and blocking compounds, kits and accessories. Tapes and sealing materials. Connectors and tools. MS² modular splicing and cross connect systems. Holding and fastening devices. Telephone installation system.

For answers to your problems, write Electro-Products Division, Dept. EAJ-1, 3M Center, St. Paul, Minn. 55101. If we don't have an answer for you today, we may just invent it, and make it do your job better.

3M COMPANY

3M. We'll give you a hand, inside or outside plant.

Circle 5 on Reader Service Card

We take a systematic approach to communications systems.
We take a systematic approach to communications systems.
We take a systematic approach to communications systems.

Plan Communications Confab for Builders

On January 23-25, 1973, the Center for Continuing Education of the University of South Florida, in cooperation with the General Telephone Company of Florida's Building Industry Consulting Service, will conduct the first in a series of "Communications Conferences for the Building Industry Consulting Service." The objective of the educational conference is to examine the external and internal relationships which are an integral component of the building industry consultant's assignment and to provide insights into the effective management of those relationships. The conference, which will be held at Tampa's International Inn, is designed specifically for the Building Industry Consulting Service, but should be of value to any member of the communications industry who maintains a working relationship with the building industry.

Persons or firms desiring more information about the conference should contact the *Center for Continuing Education, University of South Florida, Tampa, Florida, 33620 813-974-2403.*

Minicomputer Communications System Aids Newspaper Delivery

A unique minicomputer communications system is guiding a Fort Worth, Texas newspaper delivery truck along a complex route and tells two men mounted on either side of a specially designed vehicle when to throw their papers.

The system is a completely self-contained, on-board system which directs the operation of the newspaper truck and controls its deliveries. It does not require special transponders or electronic signalling devices to be installed at strategic locations along the route.

In effect, the system continuously measures the vehicle's location in relation to a pre-planned route, then issues audio and visual instructions which guide the driver and the paper throwers on their appointed rounds.

The system even activates the vehicle's turn signals shortly before it is scheduled to make a turn, to give the driver added advance warning of the impending maneuver.

For good measure, the system also detects driver errors and immediately prescribes appropriate corrective actions.

Because of the system's unique guidance capabilities, neither the driver nor the throwers need to be armed with maps, subscriber lists, or prior knowledge of the route. It's all done by tape and computer memory.

All the system hardware is mounted in a special installation above the truck's windshield, except for a digital display console mounted atop the dashboard in front of the driver which provides visual instructions.

Directed by a precision, minicomputer-controlled guidance system, this newspaper delivery truck driver has little chance of missing a subscriber's home when he's delivering daily newspapers to readers in Fort Worth. The first system of its kind in operation anywhere, the system issues visual commands, telling the driver when to turn, what streets to take, and the like, via a small display screen mounted in a console (inset) in front of him. The tiny computer, a Naked Mini 16, built by Computer Automation, is installed in a space above the windshield.

The system includes a miniature Naked Mini digital processing and logic unit with 4K/16-bit words of core memory, a tape cartridge drive, proprietary sensing devices, control/display console with message printer, and a variety of annunciator and actuator devices.

The Naked Mini computer mounted in the rack is programmed to analyze the output of speed and direction sensors. The computer computes the path of the vehicle and compares it with a route "signature" recorded on the tape cartridge. It then issues instructions and commands, as required.

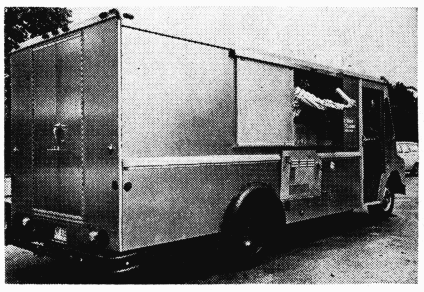
Here's how it works:

First, a fixed route is divided into segments and a "signature" for each segmet is recorded by driving over the segment with the AVCON system operating in its mapping mode. Locations of delivery points are recorded when the driver or an assistant depresses a switch at each location. These locations are sited in terms of distance from the beginning point of a segment.

For basic route control, verbal instructions are recorded on audio tape. Cues for advancing the tape and for activating the vehicle's turn signal are added to the route control tape.

To travel over a previously mapped route, the driver simply starts the route at a specified point and follows the system's real-time audio and visual commands.

For example, when a driver approaches an intersection where a left turn should be made, the left turn signal goes on and a voice message gives the command: "turn left," and names the street. The driver needs to make no reference to maps or subscriber lists. If a driver departs from his specified route, or misses a command, the system sounds an error signal, then produces a message describing the error and gives instructions for corrective action.

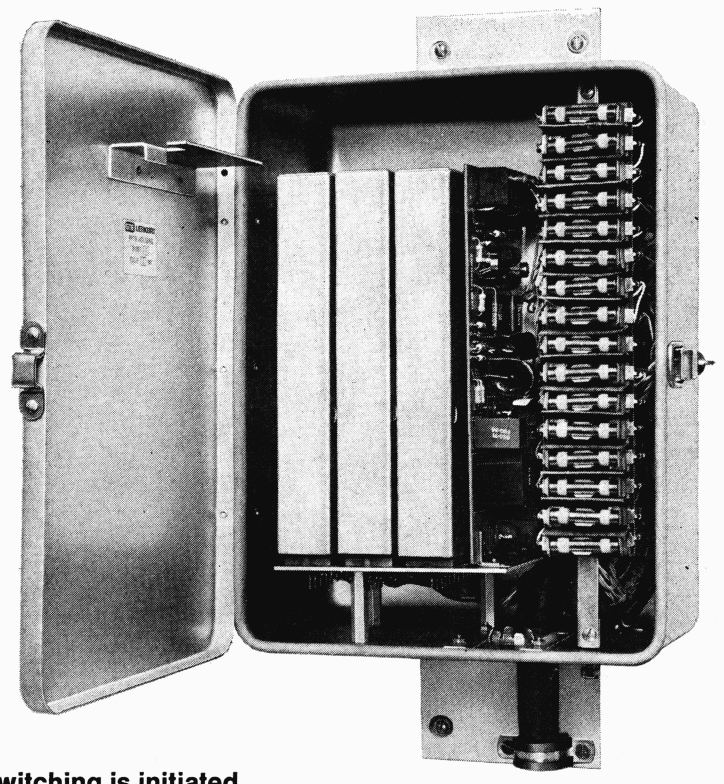


This specially-designed delivery truck wends its way along Fort Worth streets, unerringly seeking out subscriber homes under the direction of a powerful minicomputer system installed in the driver's cab. The computerized system tells the driver where to go via a display screen, activates the turn signals on his truck, and tells him when he takes the wrong direction. The system also directs signals to earphones worn by two men mounted on either side of the truck, telling them when to throw their papers toward subscriber homes.

A quick introduction to our latest generation of PCM repeatered line equipment.

Fully compatible with new or existing D1, D2 and D3 type PCM systems.

Built-in reversible strapping plugs for single or two-cable operation and for through or looped power means smaller repeater inventory.



Housings for 3, 10, and 25 units, each with a variety of cable stubs and auxiliary gas tube protection.

A nominal current of only 100 ma for each repeatered line means fewer power feed points.

Span-line switching is initiated automatically from error detection units in the office repeaters or manually from the PCM channel bank.

Automatic equalizers compensate for variations in cable loss due to temperature changes and eliminate the need to inventory, install, test, and maintain LBO's.

Meet our 9101C, third generation in a family of high quality PCM repeatered line equipment. It's a generation full of pleasant surprises. For example, it's priced as much as 30% lower than the older ones. But, since the 9101C repeaters are fully compatible, they can be used for replacement and expansion on existing PCM lines.

But repeaters and repeater housings are only part of the system. The line equipment also includes a line terminating shelf, order wire, and span-line power supplies.

The 9101C can be used for new intertoll, toll-connecting, exchange, and subscriber lines up to 100 miles or more.

For more complete details about our latest generation, write GTE Lenkurt, PCM Repeatered Line Equipment, Department C134, 1105 County Road, San Carlos, California 94070.

GTE LENKURT

Circle 7 on Reader Service Card

NA Van Lines Personalizes Its Communications

A communications system recently put into operation at the headquarters of North American Van Lines in Fort Wayne is helping the company deploy its moving men and vehicles more effectively and, at the same time, provide more "personalized" service to customers.

The new installation has allowed North American to shut down four regional dispatching offices across the United States and consolidate their operations into one central unit at the home office in Fort Wayne. Employees in the Fort Wayne dispatch center use the system to obtain daily reports from 870 local moving firms that serve as North American agents throughout the United States.

The communications system has two main parts: a switchboard that provides a variety of fast, automatic services for the 400 telephones in North American's building; and Wide Area Telephone Service lines to all *sections* of the United States. The arrangement was provided by General Tel of Indiana.

North American's new switchboard, although operator-attended, also automatically provides various services which had to be performed by operators with its older models. The automatic features were designed to speed up the process of communications among employees and with persons outside the building. The equipment is known as a Type 301 private automatic branch exchange.

Before the new system was installed, 90 per cent of North American's telephone communications services were handled by switchboard operators. The company relied on two manually-operated boards to process some 2,500 calls from van operators, and three PABX boards to handle an additional 3,000 incoming and outgoing calls each day.

"We may have as many as 1,000 major shipments moving across the country on any given day," says Bruce Kryder, North American's Director of Communications. "Our new centralized dispatching facility enables us to exercise more effective control over our shipments and also utilize moving vans and personnel more efficiently.

Members of the Fort Wayne dispatching staff make telephone calls to the majority of the 870 local North American agents every day to maintain a complete, up-to-date list of new orders and to learn the whereabouts of all available moving vans. With this timely information in hand, the dispatch center can quickly assign new shipments to available vans.

"Improved control over shipments and vehicles makes it possible for us to provide more efficient service to customers, who want their goods moved quickly and on time," says Kryder.

Drivers of all North American vans traveling with shipments call their fleet controller at the dispatch center each day to report on their locations. "We receive hundreds of calls a year from customers asking whether their goods are being moved on schedule," says Kryder. "The drivers' daily phone calls enable us to give our customers accurate reports on their shipments . . . a service that's really appreciated."

North American, the country's second largest mover of household goods, moves 105,000 families a year, a task requiring 3,000 drivers. The Fort Wayne dispatch center has a staff of 110 persons coordinating the activities of the local agents and drivers.

The new switchboard has the capacity to serve 600 telephone extensions . . . nearly twice the number it now handles . . . thus allowing for future expansion.

Taiwan Power Orders RCA Radios

Taiwan Power Company has ordered a $150,000 RCA two-way mobile radio system to provide a communications network covering its vehicle fleet and power stations in the Republic of China.

The purchase includes 222 items of equipment . . . all-solid-state mobile radios, radio base stations and remote control units . . . to provide communications service in and around Taipei and other Taiwan cities.

The two-way system was marketed by Hwa Sheng Electronics Company, RCA distributors in Taipei. Hwa Sheng officials said the communications network was needed to improve output and maintenance of the power system to keep pace with the island's economic growth.

WU Data Will Sell Teleprinter Paper Nationally

Western Union Data Services has announced that it will market teleprinter paper products on a nationwide basis.

Data Services will offer a line of paper rolls, fanfold forms and paper tape for use with Teletype Model 33s and 35s, and GE TermiNet series and other teleprinters on the market.

The paper rolls are carbonless and are available up to seven plies which reduce handling costs.

For complete information, use the handy Reader Service Card in this issue or write *Western Union Data Services, 16 McKee Drive, Mahwah, New Jersey 07430.*

For more info circle 51 on Reader Service Card

Philco-Ford Gets Order for Cheyenne Mountain Update

Philco-Ford Corporation's Western Development Laboratories Division in Palo Alto, California has been awarded a $22.3-million contract by the United States Air Force Systems Command's Electronic Systems Division headquartered at L. G. Hanscom Field in Massachusetts, to update the North American Air Defense Command's Cheyenne Mountain Complex near Colorado Springs, Colorado.

The program, designated 427M, calls for the integration of large-scale command and control computer systems and of an upgraded communications system at the complex deep within the mountain. NCMC is the command and control center for the air and missile defense forces on the North American continent, and is responsible for giving early warning in the event of impending attack.

The 427M cost-plus-incentive-fee contract covers a three-and-one-half year period, with the job expected to be completed by mid-1976. Of the total award, $10.1-million has already been obligated for the first phase of the program, and work will begin immediately.

Philco-Ford has been a major supplier of equipment and services to NORAD and its NCMC over the past 12 years.

If you're using more than a single data terminal, you need a centralized terminal support system.

How else can you know the status of your entire system?

And that's one of the key jobs of Termicare—to detect system problems and inform you of them. We do it by monitoring all your terminals in one place, our Termicare Center (shown below).

At the Center we maintain files on all terminals leased from us. So when you call in we know who you are and what equipment you have. A pool of experts is on hand to test your terminals and diagnose problems.

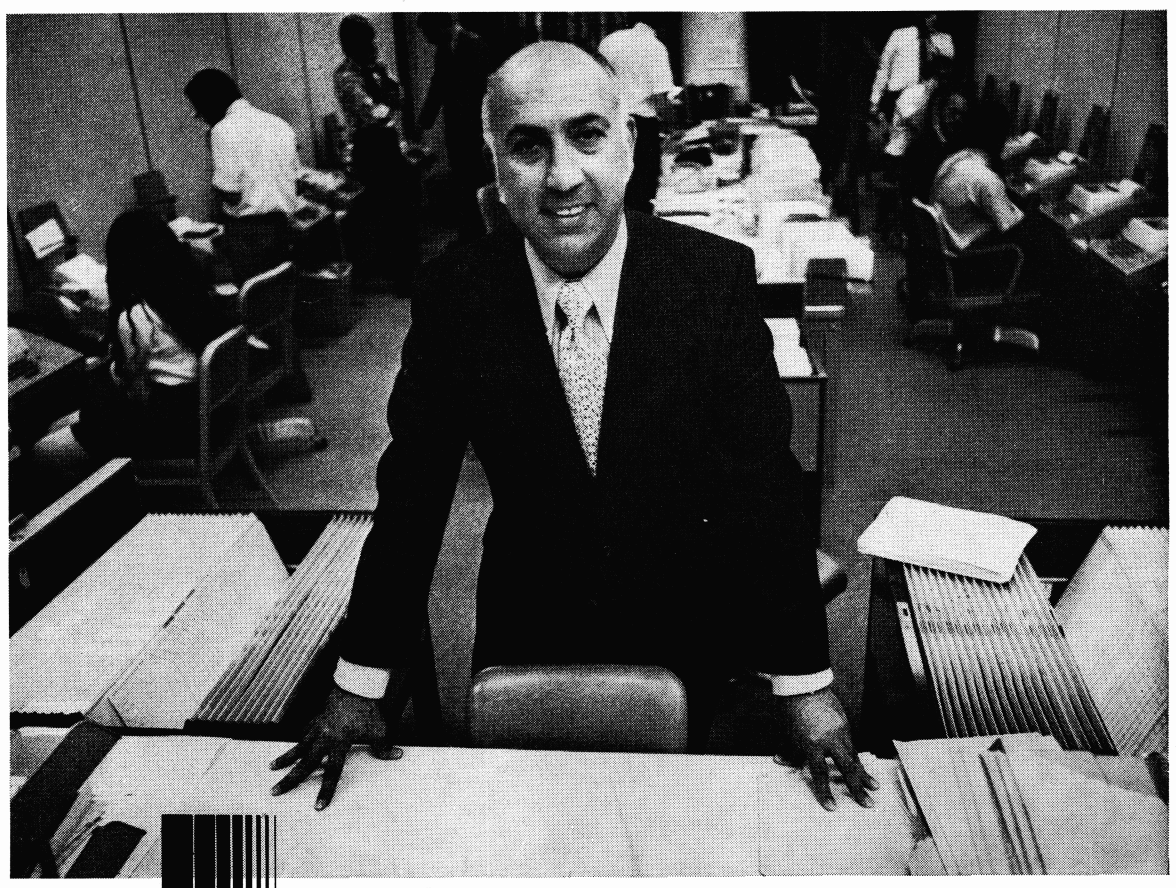
We can dispatch field technicians from 457 service locations. And from our Center we follow up each service call.

And because we have centralized record-keeping we're able to analyze terminal performance and use this information to improve terminals.

Termicare is just one aspect of the services we offer for your terminal system. And your system is our major concern. We do everything we can to support it. We make certain you get the optimum terminals, out of our selection of 62 models with 112 options. And we install them right by testing them at our Termicare Center.

So if you are a multi-terminal user, we can be your single terminal source. Find out by contacting me at 800-631-7050 (N.J. 201-529-1170) or write to 16 McKee Drive, Mahwah, N.J. 07430.

"And we have it for you with our Termicare® system."
Z. V. Zakarian, president

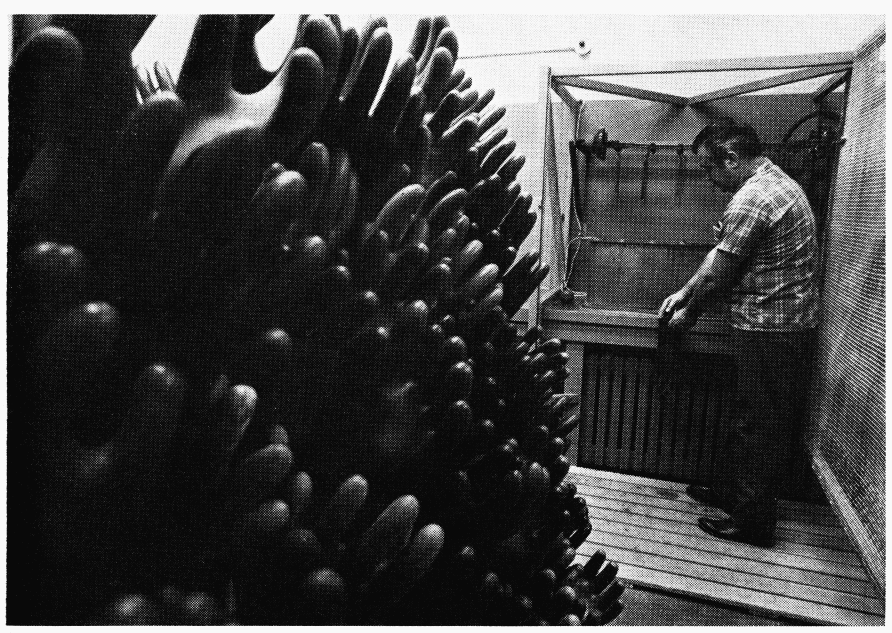


western union data services company

Circle 8 on Reader Service Card

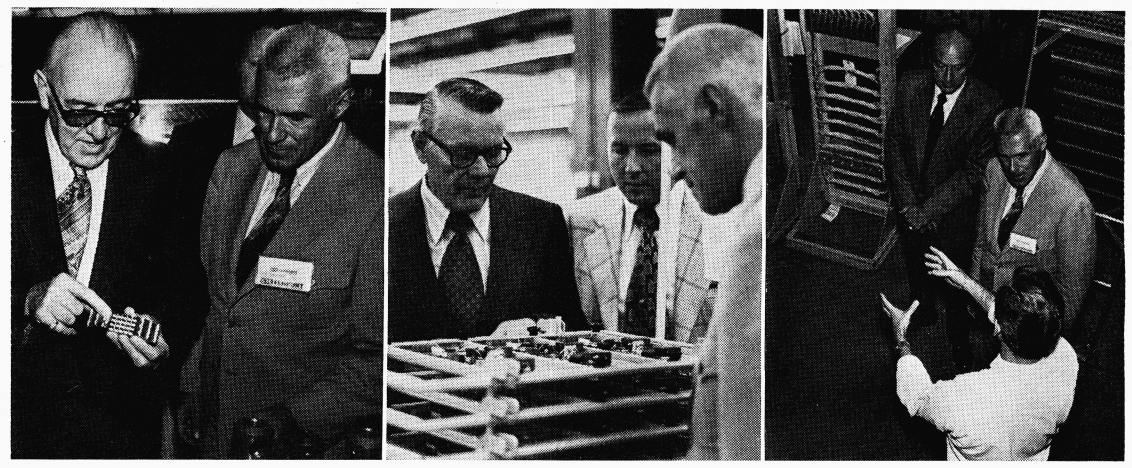
WINNER of this year's Elgin Electronics $2,500 charitable drawing at USITA was Mrs. Seth Arnold (right), secretary of Century Telephone in Plain Dealing, Louisiana. ITPA President Ellen Neale presented the check . . . which will be given to the Plain Dealing Academy, a children's school, to be used in its building fund.

Communications news ... in pictures ...

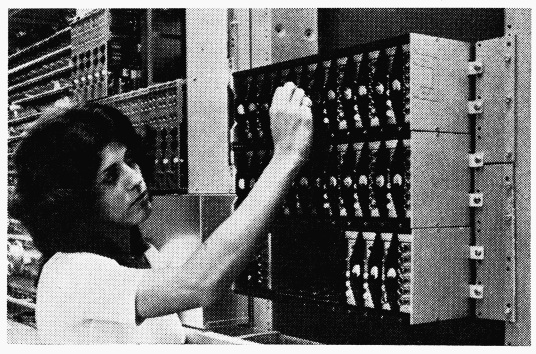


APPLAUSE! Louis Sylvester, utilityman for General Telephone Company of California, looks as if he's receiving an ovation as he prepares to test rubber gloves used by the company's linemen when they work near high-voltage facilities. The gloves are filled with a saline solution, hung on metal chains in a test cage, then subjected to 10,000 volts of electricity to assure that they have no defects. The "hands" at left are gloves which have been hung up to dry after successful testing.

LONG RANGE PAGING has come to Ireland with the recent introduction of a Motorola "Pageboy II" system for the greater Dublin area, the first such service in Europe. Providing voice messages as well as "bleeps", the system operates around the clock, seven days a week. Shown here at the recent reception in Dublin are (from left) Donough O'Connor, chairman of Contractaphone; Minister for Posts and Telegraphs, Collins; and Miss Denise Lavaud, a demonstrator.

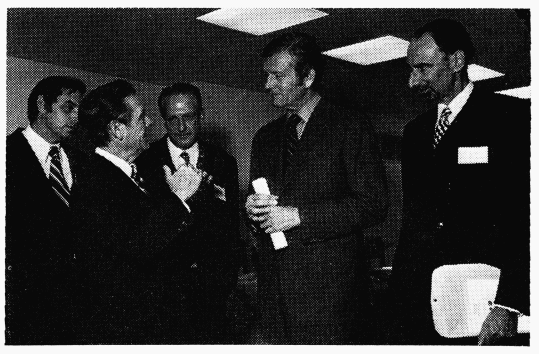


FROM COMPONENTS TO COMPLETE RACKS, CN Publisher Bruce Howat recently saw the inner workings of the manufacturing facilities of GTE Lenkurt at San Carlos, California, and Albuquerque, New Mexico. At left, Lenkurt's George Ewing, vice president—manufacturing, describes a Lenkurt-built component to Howat and General Tel's Tom McCarthy; in the center picture, Lenkurt's Bob Gamble and Tom Curry show how printed circuit boards are transported along the production line; and, at right, Lenkurt's Fred Hill watches as final testing and shipping procedures are explained.

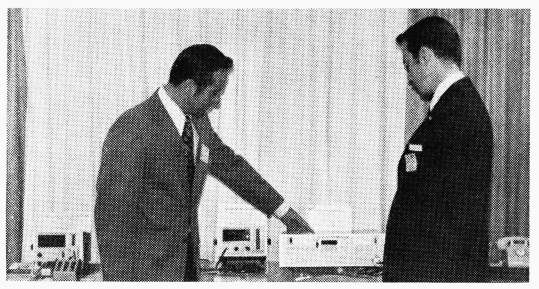


PROTECTION FOR PRESIDENTIAL circuits is on the mind of Jewell Sykes, "switchman" at Southern Bell's Homestead, Florida, central office, as she checks out a new VICOM Automatic Line Transfer System installed primarily to protect Presidential circuits to the Florida White House at Key Biscayne. The system is being used in conjunction with Western Electric D1B channel banks and T1 repeated lines.

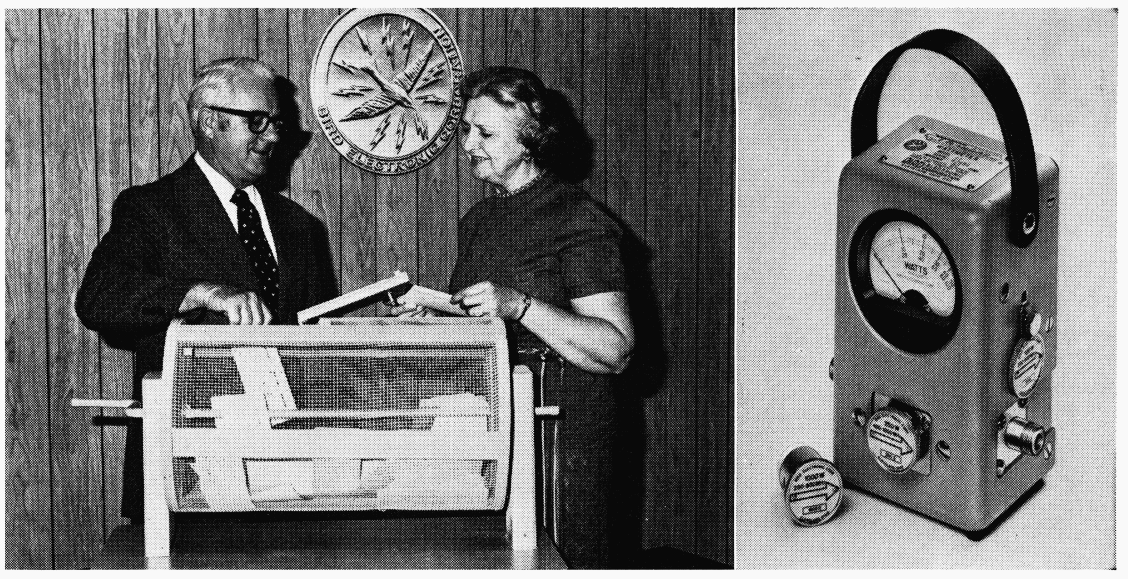
DRUG PROGRAM in North Bergen, New Jersey is being aided by a "Record-O-Phone" which answers phones after drug program's office closes for the night and on weekends and gives callers an emergency number. Here Ed Cappucci (left) general manager of Record-O-Fone, demonstrates the telephone answering machine made by his company and loaned for use with the community drug program while looking on are Peter Mocco, mayor of North Bergen (seated); Frank Levy, drug program corordinator; and Robert Kornberg, the program's director.



MAYOR JOHN LINDSAY of New York listens as Ed Gallagher, president of Western Union International, explains the revolutionary new computerized communications center housed in the WUI Building which the Mayor dedicated recently (see story, page one). Others in the group include Kenneth Patton, Administrator of the Economic Development Administration for the City of New York (left), Roy Andres, vice president for planning for WUI (left of Gallagher), and beside the Mayor, Helmut Friedlander, a member of the Board of Directors of WUI . . . which has come a long way since "divestment" back in October, 1963! Housed in the new WUI Building at "One WUI Plaza" overlooking Battery Park will be one of the most modern communications centers in the world. Utilizing the latest technology, computer hardware and advanced programming philosophy it will provide computerized message, telex and leased channel service between the United States and over 150 countries served by WUI's global network.



NATIONAL ELECTRONICS CONFERENCE recently drew over 5,000 people to the Regency Hyatt O'Hare in Chicago. Here Ed Vose (left) tells CN Managing Editor Ken Bourne about Boonton Electronic's new Model 102A FM/AM VHF signal generator with LED digital frequency display which covers 5 to 520 MHz.



CELEBRATION OF 50,000th Bird "Thruline" Wattmeter (right) production was highlighted by a drawing of 20 lucky names from several hundred who responded to an offer made in a Bird Electronic ad in the March issue of *Communications News* . . . the winners receiving free plug-in elements for their model 43 RF wattmeters. CN District Manager Ralph Helfrick (left) did the drawing . . . and here he hands a lucky name to Bird Electronic's president, Mrs. H. J. Bird.

We just spent $2 million to keep them out of trouble.

Every once in a while the people who man your international communications run into a bit of trouble.

Somewhere along the line something fails—and suddenly your leased channel or telex is out.

This is where we come in to get you out of trouble. Fast.

Our new Communications Control Center is the most advanced quality control system in the industry.

It took us four years and a couple of million dollars to build it.

It was worth it.

Because now we can locate transmission problems in a few seconds. And fix them. This goes for all our services... Telex. Leased channels. Telegrams.

What's more, the new system provides computerized scanning of all tie-line circuits. So we often get your operators out of trouble even before they realize they're in it.

You can't get much faster than that.

Our Communications Control Center is only part of a program designed to give you—and your operators—the highest transmission quality in the industry.

As for your communications people, we just want to keep them happy.

You see, the way we figure it, if they're in trouble we're in trouble.

ITT World Communications Inc., 67 Broad St., N.Y., N.Y. 10004.

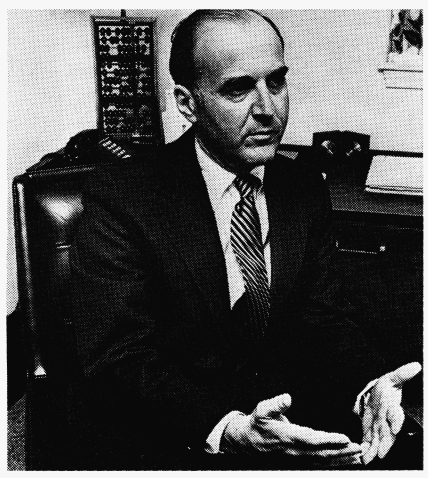
Just give us the word.

World Communications Via ITT

Circle 9 on Reader Service Card

Chicago's Beverly Bank Computerizes All Customer Service with "Touch-Tone"

Beverly Bank in Chicago is totally committed to computerizing all customer services. The key to the entire system is assigning each client a single account number no matter how many accounts (checking, savings, loans, and so on) they maintain. Each customer gets just one combined monthly statement showing his exact total financial situation. And all information is stored in an IBM 370 computer, accessed by several types of terminals including Touch-Tone telephones.



"Why shouldn't you eventually be able to bank from home", asks Tom Markle, president of Chicago's Beverly Bank, adding, "A lot of people save for a specific purpose so when they need the money why should they go to the bank for a transaction? The time will come when they should be able to automatically transfer funds from home merely by using a Touch-Tone telephone and giving the computer instructions."

Same Number for All Accounts

"Most banks have different account numbers for each type of account," points out Jim Nieds, Vice President for Marketing. "What usually happens is that the various departments are in separate areas and customers have to go to different windows for different services. As a result, they often have a separate monthly statement for each account which makes it harder for them to know their total financial situation. Our tellers, on the other hand, are able to handle all routine transactions, except for such items as making a loan which require an officer's approval.

"This division of labor often makes it harder for the average bank to judge the overall profitability of its customers and maybe miss good opportunities to cross-sell services."

The combined monthly statement has won wide acceptance from the bank's customers and has allowed Beverly Bank to eliminate a lot of unnecessary paperwork. For example, passbooks have been discontinued for savings accounts. At many banks this is optional, but at Beverly Bank they have been abolished entirely. The monthly statement lists deposits, interest and withdrawals, and this information is given regardless of whether a customer has more than one type of account.

May Abolish Passbooks

The idea of abolishing passbooks isn't as revolutionary as it sounds according to Tom Markle, president of Beverly Bank. "I can remember when there were passbooks for checking accounts," he says, "and it's not convenient to always have it with you . . .

A teller at Beverly Bank accesses a computer simply by inserting an identifying card dialer card into a Touch-Tone telephone. The dialer cards are assigned code numbers which allow the computer to identify authorized callers, and also, what level of information to give out. Obviously, this varies between a bank officer needing details about a mortgage loan and a teller needing to know if funds are available in a savings account.

especially if you have sent it in when making a deposit by mail. This runs completely counter to making quick transactions which is our entire approach.

"A computer holds tons of information," Markle continues, "and the secret is to crystallize this into meaningful information. So our monthly statement does just that and gives our customers a much better view of their entire financial picture.

"You see what we set out to do is have complete information about a customer. For example, if a customer comes in to cash a check and there isn't enough money available, our system is programmed to come back with additional information. While there mightn't be enough in the regular checking account, the check can be safely cashed because there are enough funds available in, say, the check credit account.

"What a difference this can make to customer relationships! You get a more favorable response if an officer can say 'there's not enough available in your checking account to cover this amount but there are sufficient funds in your savings account or check credit account—would you like me to arrange a transfer?'

"So we call our statements 'Money Managers' and we do everything to see that our customers aren't inconvenienced. For example, on the statement we list checks in numerical order. Everything is done to make all transactions less confusing. And we don't charge any special fees either for all those services."

Use of Telephones Makes Training Easy

Beverly Bank is owned by Beverly Bancorporation of Chicago, which in addition provides a full range of services to nine other non-owned banks in the Chicago area. All have access to the Computer Information System which pulls together all interrelated information from scattered locations into one central computer where a separate file is maintained for each bank.

This information is easily accessible to personnel in the individual banks who can retrieve it after proper identification, right at their work stations. Eighty-seven per cent of these transactions are made through what Beverly Bank officials feel is the least costly of terminals . . . Touch Tone telephones.

As Nieds puts it, "the telephone is a natural legacy from your teens so a new teller, for instance, isn't afraid of it. It seems natural to 'talk' to the computer in such a fashion and it makes training a lot easier."

A teller or bank officer at any of the locations served can call up the computer by merely inserting an identifying card into the Touch-Tone "Card Dialer" telephones. Every month, Nieds estimates, there are in excess of 200,000 inquiries made in this fashion. The card dialer cards are equipped with code numbers which allows the computer to identify authorized callers, and also, what level of information may be given out. Obviously, this varies between a bank officer needing calculations about a mortgage loan and a teller needing to know if funds are available in a savings account.

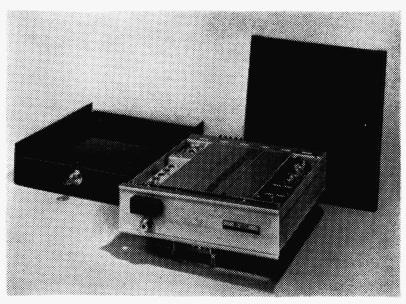
Beverly Bank is looking ahead to other ways to modernize banking. "Why shouldn't you eventually be able to bank from home," asks Markle. "For example, a lot of people put money in their savings accounts to earn interest while they're building it up for a specific purpose. So the time comes when you need it. Why should you have to go to the bank to make the transaction? Why not make it automatically from home by using the Touch-Tone telephone? Computers and telecommunications should be able to handle many banking transactions in the future.

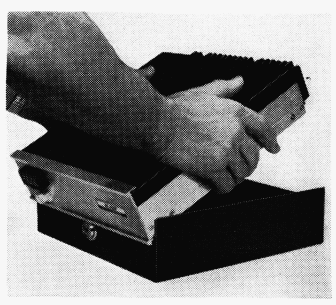
As a start in this direction, Beverly Bank is considering a service which will allow customers to call the computer on a 24 hour, seven day a week basis, whenever they want to know the balance in their accounts and find out which checks have been paid or deposited.

"I realize that other banks do this too," he says, "but it's during limited hours and usually takes a lot of time because the caller has to speak with several people in different departments of the bank and they have to look up records.

"When the service becomes operational, the customer will be able to call just one number and have all their answers instantly. The call will be answered by a bank

Mobilized





Announcing the new all-solid-state RF-450T UHF two-way radio from RF Communications. It gives you everything you could ask for in a trunk-mounted system that's right up front in performance.

You get a full 25 watts of output, in simplex or half-duplex operation. Up to 14 channels are available, from 450 to 470 MHz, and you get receive-standby operation with a low-low 0.2 amp current drain. It weighs under 15 pounds.

The transceiver takes less than 5 x 10 x 12 inches of trunk space. If servicing is ever necessary, a single key removes the radio from its mounts. And circuit boards can be removed without disconnecting a single wire.

The handsome control head, microphone, and speaker look just right in today's modern vehicle interiors; the speaker can be removed from its mounting bracket and, with its hang-up feature, hung out the window, where it can be heard by an operator anywhere in the vicinity.

The RF-450T is extra-rugged and reliable. It's completely solid state, even to the final power output stage. "Mother-board" interfacing between circuit boards virtually eliminates wiring harnesses. And chassis and frame use extruded aluminum for exceptional strength and electrical shielding.

Available options include Tone-Coded Squelch, Transmit Time Protector, and Dynamic Palm Microphone.

When you think mobile, think RF. For Land-Mobile in the UHF band, think RF-450T!

HARRIS

RF COMMUNICATIONS, INC.
1680 University Avenue
Rochester, New York 14610, U.S.A.
Tel: 716-244-5830; Cable RFCOM Rochester, N.Y.;
TWX 510-253-7469; Telex: 978464
A Subsidiary of Harris-Intertype Corporation

Circle 10 on Reader Service Card

Alford Uses High-Speed Data Communications System to Cut Order Processing Time

Alford Refrigerated Warehouses in Dallas, one of the largest such operations in the United States, is using a Memorex high-speed data communications system to slash order processing time to less than a minute and saves $1,000 per month in rental and line charges.

The firm's new data communications system helps maintain approximately 100 million pounds of commodities in running inventory throughout 30-million cubic feet of freezer, refrigerated and dry storage space. The warehouse complex consists of two half-mile-long buildings, the largest such facility in the southwest United States.

When a food broker phones in an order, it is entered via a 30-character-per-second Memorex 1240 communication terminal. This data is transmitted to a Memorex 1270 transmission control unit serving as a peripheral to Alford's IBM 360/40 central processing unit. The order is processed by the computer and retransmitted as a bill of lading anl invoice information teleprinter within the shipping department of the appropriate section in the warehouse complex.

Shipments on Way Within Minutes!

Often a shipment can be *on its way* to the food broker's customer within minutes. In any event, the shipping bay receives the order information within 60 seconds after it was entered.

Simultaneously with the dispatch of information for shipping, two Memorex 1250 terminals operating in unattended modes produce hardcopy control information on all transactions. This information is used for auditing, inventory control, and so on.

The 1240 terminals, which are used continuously nine hours a day, five days a week, by order clerks, also provide interactive information from the computer to the operator.

"The chief benefit of the Memorex terminals in this application is their speed, ease of use and pride of operation by the order clerks," says Alford EDP Manager David White.

The Memorex 1270 TCU, says White, has a number of benefits. "First of all, it is approximately $500 per month cheaper than the predecessor control unit at the Alford installation, while providing up to 96 channels of communications. We are already at 39 channels with the single Memorex equipment and expect to be above 50 channels soon. Our savings are at least $1,000 per month."

Another benefit, says White, is the Memorex TCU's flexibility, which permits simultaneous terminal operation at speeds ranging from 110 to 600 baud.

"The 1270's control panel also is extremely useful in allowing us to monitor lines and to test and isolate for possible trouble, thereby obviating the need for unnecessary service calls," says White, adding that the communications system has proved so successful that Alford has already put in terminals at a satellite warehouse in Corpus Christi, 400 miles distant.

Will Offer Service to Other Warehouses

"In effect," says White, "we have a timesharing type application utilizing the software we have developed for order processing, accounts receivable and commodity audits. We intend to offer this same service to other warehousing operations in the United States."

The Memorex 1240 operates at any of five user-selected speeds: 10, 15, 30, 60 or 120 cps. It is particularly well suited to commercial data processing operations that have high-volume printing requirements.

The unit incorporates an innovative printing mechanism, which provides high-quality multipart-form printing at high speeds. It has only about 25 percent as many moving parts as are found in earlier printing mechanisms. Reliability is correspondingly higher. Careful attention has been paid to human factors, such as keyboard layout and printline visibility, to provide maximum comfort and efficiency for the operator.

---

employee who will set up a conference call with the talking computer. Within seconds the computer will give a verbal response which the customer and employee will hear simultaneously over the telephone. It should be a lot of fun, help the customers and save us the time and expense of manual information retrieval."

A Laboratory for Future Banking

Markle firmly believes that banks that want to stay competitive in the future must build data bases of interrelated customer information, tied together by an on-line system, accessible through terminals such as the Touch-Tone telephone. If small banks are unable to offer these services, they'll have to team up with others to provide them.

"That's why Beverly Bancorporation built their CIS system which offers total services to all participants. Each day we become more convinced that a total systems approach is far superior for banks and for customers than the single system approach which treats each application and each customer on an unrelated, individual basis.

"We know it works," he concludes. "We have a laboratory here with all the banks involved. Our employees are all doing their jobs more efficiently as a result, and naturally, this competence is passed on in better service to our customers."

STATEMENT DATE 09-30-71 ACCOUNT NUMBER 1234560 PAGE 1

CHECKING INFORMATION

01	SUB-ACCOUNT NUMBER
16	NUMBER OF ENCLOSURES
564.26	BALANCE FORWARD
1,279.68	DEPOSIT TOTAL
667.93	CHECK TOTAL
.00	HANDLING COSTS
1,176.01	ENDING BALANCE

YOUR FINANCIAL PROFILE FROM 09-01-71 TO 09-30-71

Beverly Bank

MR. TOTAL CUSTOMER
4321 MAIN STREET
ANYTOWN, USA 60000

CHECK#	DATE		AMOUNT
	09-01	TR	50.00
	09-15	TR	50.00
0642	09-01		2.06
0643	09-04		24.00
0644	09-01		50.00
0645	09-02		60.00
*0647	09-06		37.54
0648	09-04		2.08
0649	09-10		150.00
0650	09-13		10.00
*0652	09-16		9.00
0653	09-15		11.75
0654	09-18		60.00
0655	09-22		95.92
0656	09-25		1.72
*0658	09-24		33.86
0659	09-28		10.00
0660	09-29		10.00

DEPOSITS

09-04		300.00
09-15		480.00
09-30		499.68

ADDITIONAL BANKING INFORMATION

TRANSACTION	DATE	BALANCE
REGULAR SAVINGS 01		
	08-31	429.43
TR 50.00+	09-01	479.43
75.00+	09-10	554.43
TR 50.00+	09-15	604.43
IN 5.41+	09-30	609.84
BONUS SAVINGS 02		
	08-31	217.25
25.00+	09-10	242.25
25.00+	09-30	267.25
IN 2.16+	09-30	269.41
CHRISTMAS CLUB 03		
	08-31	25.00
5.00+	09-03	30.00
5.00+	09-17	35.00
5.00+	09-30	40.00
IN .40+	09-30	40.40
CERTIFICATE OF DEPOSIT 04		
	09-30	1,000.00

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Who makes you 10% better than your competition?

Because StarSet Girl is 10% more productive on the telephone.

StarSet® communications set is a miniature electronic telephone receiver with built-in microphone. It's the most efficient device known for working on the telephone. With StarSet, your girls will never have to touch the hand receiver again. They'll be free to stand up, pull files, complete forms, work with both hands all the time they're carrying on a private telephone conversation. They'll be free to accomplish more work in less time.

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StarSet. From your telephone company.

StarSet Girl.

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A preview to CN's exclusive "Guide to Interconnect"

The Maturing of the Interconnect Industry

By Jay Pidto

Vice President
Arcata Communications

You would be hard pressed to name an industry which proceeded from first breath to maturity in as short a time as the interconnect industry.

While there have been mistakes during this race to substantiality, they have now been largely overcome. Interconnect companies have, on the whole, learned who they are, why they are and what they must do to earn a permanent, prominent place in the businessman's world.

Our reason for existence was our specialization: we were born to serve the business community exclusively. The demand for our expertise stems from the utility phone company's refusal to help the businessman reduce his phone expense (or make his phone communications more efficient, which is the same thing). The telephone company's business is to reap the maximum amount of revenue from the use of its instruments and line network.

And the telephone company cannot specialize. The telephone company, by law, must concentrate on providing a certain level of service to everyone . . . from the Pentagon on down to the most remote rural household. Our business, on the other hand, focuses sharply on the business community. We earn our ever-increasing following by designing, installing and servicing phone systems which will meet the precise needs of the businessman . . . in his auto dealership, his stock brokerage offices, his chain of hotels or wherever he requires from 10 to 2000 phones. Our industry has proven we can give that businessman the kind of communications he needs and has never been able to get. Furthermore, we can provide dollar effectiveness in the process.

The telephone company, by the very nature of its business, benefits when inefficiency is a built-in feature. Its prime revenue depends on the use of its network rather than from rental of equipment. Therefore, it wants its system used to make the maximum number of toll calls. For example, a telco would rather not offer a user the ability to transfer incoming and outgoing calls. Such transfer reduces toll charges on both ends. An interconnect company is of course delighted to offer the efficiency advantage of such transferring.

As another example of revenues-versus-service, the telco has succeeded in making it most difficult for a user to identify his telephone costs specifically. Not impossible, but difficult. Both Centrex and Q-Z billing will provide cost-pinpointing for the businessman. But the added expense discourages use of Centrex and Q-Z, offsetting their potential savings in identifying where the money is going.

Know What Businessman Wants

However, the interconnect industry in the course of its maturation has learned that the businessman is interested in more than just the money we can save him. What he is really excited about is the improvement in communications we offer. He recognizes that designing for him a communications system to fit his unique needs will make his daily commerce run more smoothly, eliminating the gnawing recurring communications pains he suffers. To bring the businessman the widest possible range of phone capabilities for this purpose, the leading companies in our field procure an impressive array of special equipment from all over the world.

Wonder at being able to procure for the first time a really efficient, well-behaved communications system temporarily blinds the businessman to the fact that he is achieving something else. He finds that the interconnect company has helped him cut all of his phone costs. That's because the original objective was truly better communications, not a matter of increasing the need to telephone.

From Zero to 180,000!

In maturing, we have learned to be frank with the potential user of our services in regards to equipment ownership. We tell him the financial advantages of owning his own phone system are considerable only if his company is stable in its location and can regard the system investments long-range. But the advantages of efficient communications start paying off at once. Then, slowly, comes the pleasure of immunity from equipment rental increases which the utility telco bestows with predictable regularity.

By offering the commercial market beautifully specialized communications systems—and by learning how best to merchandise their advantages to businessmen—our industry has gone from zero to some 180,000 installed lines in just four years. Our success from here on will depend upon our remembering always, in every contact with a customer or potential customer, that we are not in the telco's business of selling phones and collecting tolls. We are selling dollar-effective *total communications.*

The PABX Market

PABX/PBX MARKET PROJECTIONS

1971	$40 million
1972	80 million
1973	120 million
1974	180 million
1975	270 million
1976	380 million
1977	530 million
1978	690 million
1979	900 million
1980	1170 million

Source: *Frost & Sullivan*

AFTER THE SHOUTING HAS DIED...

Norelco® TELEPHONE SYSTEMS,
interconnection you can live with

You'll receive attention from everyone . . . the phone company and interconnect vendors . . . when you're ready to put in a new system. But, how about later, as the years pass?

Here's how Norelco will help you today, tomorrow . . . and the days after that:

QUALITY EQUIPMENT . . . Norelco produces its own equipment, one of the largest telephone manufacturing facilities in the world.

MODERN DESIGN . . . advanced common control to start out with, continuing product development of plug-in modules to provide new telephone features as they become popular (yes, CENTREX too!)

FIELD SUPPORT . . . 24-hour a day service behind any Norelco installation. Responsiveness equal to or better than any organization. Plus . . . application engineering, operator and station user training plus personal attention to your problems.

FLEXIBILITY . . . solutions to your growing and changing needs over the years instead of telling you what their pre-set packages are.

A Norelco Communications Consultant will talk expertly, not loudly to you. For a factual comparison of equipment capabilities, costs and service, call or write Norelco. Please.

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Circle 12 on Reader Service Card

A Guide to the Interconnect Market

Why Own Your Own Telephone System?

Thanks to the historic Carterfone decision by the FCC (1968) and the cooperative compliance of AT&T in establishing enabling tariffs (1969), you now have a choice: you can rent your telephone system from your local telephone company or you can own (or lease) your own telephone system and *interconnect* it with the nationwide (actually *worldwide*) telephone network.

Nearly everyone agrees that the 25 Bell companies and the 1,800 Independent telephone companies provide the finest telephone service available anywhere in the world . . . connecting the 125,504,900 telephones all over the United States and linking them with most of the 155 million more telephones in the rest of the world. Telephone service in the United States is fast, efficient and, relative to the cost of other goods and services, very economical.

So why does anyone want to own his own telephone system?

There are three reasons for considering owning (or leasing) your own telephone system and *interconnecting* it with the telephone network . . . communications cost savings, improvements in communications service, and aesthetic considerations, chiefly space savings. ITT's Dick Farley sums up the advantages this way: "There are economic advantages, more options, and, almost universally, greater compactness."

Cost Savings Are Most Important

Virtually every business and institution is a candidate for interconnect because both large and small firms can realize significant reductions in their budgets for voice communications . . . if their situation is "right" for interconnect.

For example, back in 1970 American Express decided to install interconnect telephone systems in its New York City, Atlanta, Springdale (Pennsylvania), and Fort Myers (Florida) offices when studies showed the following monthly savings over comparable common carrier equipment: New York, $417; Atlanta, $166; Springdale, $405; and Fort Myers, $3,010! Using an eight-year lease purchase plan, annual savings were estimated as follows: New York, $5,004; Atlanta, $1,992; Springdale, $4,860; and Fort Myers, $36,120. Herb Granger, American Express communications director and current president of the International Communications Association, projects 10-year savings as follows: New York, $61,632; Atlanta, $29,568; Springdale, $33,320; and Fort Myers (which was installed on a five-year lease purchase), $768,600.

In a 20-year view, Granger estimates carrier costs in New York at $272,640 compared with $103,008 for his own system . . . a $169,632 savings! Twenty-year savings at Atlanta are expected to be $97,728; at Springdale, $335,520; and at Fort Myers, a whopping $1,944,600!

For example, this year a new Howard Johnson Motor Lodge opened near Kennedy Airport on Long Island . . . with an interconnect telephone system. Manager Henry Nanna says: "I recently managed a motor hotel in New York City that had slightly more than 350 rooms. We paid New York Tel $2,830 per month rental for phone equipment. This new Howard Johnson facility has 400 rooms and pays slightly more than $2,000 per month. And, after ten years, we own the equipment!" Nanna projects the savings for the eleventh year and after at $36,000 a year!

For example, the United Auto Workers recently installed an interconnect communications system in their new regional headquarters in Madison Heights, Michigan. The new system has dropped the monthly phone bill for this UAW office down to $225 from a previous level of $650. Over a 10-year period, the operation of the system will cost a total of $49,231 . . . a saving of more than $28,000 over Bell's proposed $77,688 rental-only system.

Purchase of your own interconnect system automatically eliminates the equipment portion of the monthly telephone company rental charges, which does not build equity. In addition, the equipment owner may take advantage of investment tax credit applicable to his system, further reducing his costs. Lease/purchase plans are also available to aid cash flow by extending payments over a long period. When the equipment is fully paid for, only maintenance and line facility charges remain. And it is at this time you will fully appreciate the impact of interconnect.

Possible "rules of thumb" for evaluating whether dollar savings are great enough to warrant consideration of an interconnect telephone system are: *savings of at least 17 to 19 percent of projected telephone company charges . . .* and *a return on your investment within five years.*

Stability of communications costs is also important.

Beyond pure telephone equipment cost savings, there may be important revenue-producing and/or cost-saving aspects associated with the communications tricks a well-designed interconnect system can perform for a company.

Service Improvements Are Possible

An interconnect telephone system tailored to real user needs can offer advantages almost as great as potential cost savings. Indeed, these advantages often *are* cost-savers . . . or *revenue producers.* Such features as abbreviated dialing, call-splitting, camp-on, conferencing, dictation access, executive right-of-way, intercept, night transfer, sequencing, voice paging, and a whole host of other options (see pages 20 and 21) may enable an organization to greatly improve its over-all communications performance. And many of these features are just simply not available from the telephone company.

Space Savings Usually Are Effected

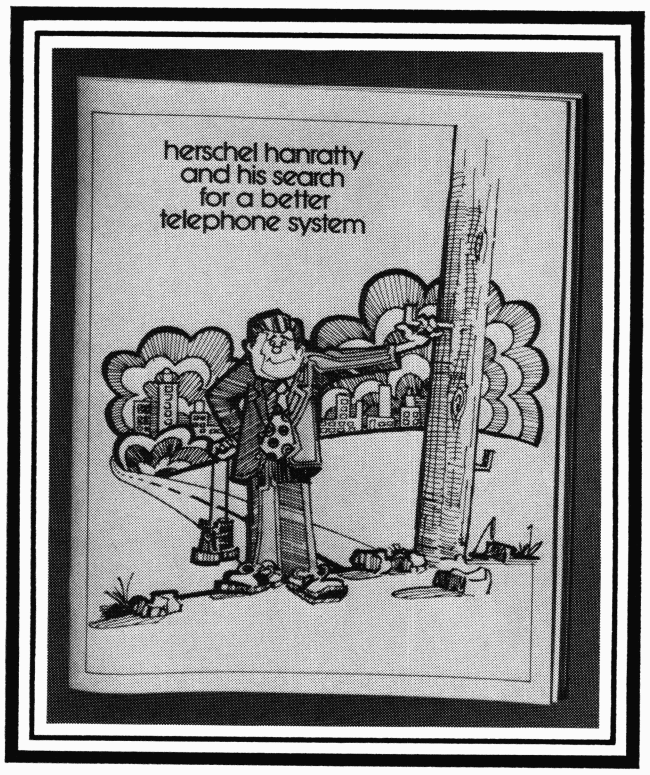
Most interconnect PABX systems are electronic or crossbar systems . . . and everything about them is more compact than older telephone company equipment. Consuming less floor space (when office space costs from $5 a square foot up to $12 a square foot in choice New York City offices) reduces a major business expense.

Organizations which are moving into new quarters or are doing major organizational face-lifting jobs often find interconnect systems most attractive as they take a fresh look at their communications needs. Indeed, the best approach to an answer to the question "Is interconnect for me?" is to: first, familiarize yourself with communications capabilities offered by both the telephone companies and the various interconnect systems; second, analyze your organization and establish your present and future communications *needs*; third, ask both your telephone company and a number of interconnect companies to propose a system to meet those needs; and, fourth, analyze the proposals and *act* . . . to give your organization the most for its precious communications dollars.

ICC's Joe O'Brien puts it this way: "It is a *venial* sin to sit in the warm arms of your telephone company and do nothing . . . but it is a *cardinal* sin of the first magnitude to involve your company with the Edsel or Studebaker of the communications world."

Why own your own telephone system? To save money, improve service, and save space. But look before you leap! The articles on the following pages of this "Guide to Interconnect" help you to "look" . . . at both pros and cons!

FREE
guide to the many benefits of interconnect.



Herschel Hanratty is a fictional character in a real situation.

He runs a business and knows the necessity of maximizing efficiency and controlling costs. Yet, he still rents his telephone system.

This free booklet is about Herschel's discovery of the benefits of interconnect. The benefits of owning or leasing his own telephone system.

And it's about Herschel's discovery of United Business Communications. The interconnect company that provides the best of both worlds. The benefits of interconnect plus the age-old reliability of your local telephone company.

Write for Herschel's story. Read the happy ending. The sooner you do, the closer you'll be to a telephone system you can utilize as a resource to increase efficiency and cut costs. No obligation, of course.

United Business Communications, 6405 Metcalf Ave., Shawnee Mission, Ks. 66202. Telephone: (913) 362-5300.

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United Business Communications

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Renting versus Owning . . . the Trade-Offs

Three choices are open to those responsible for providing an organization with an adequate telephone system . . . and they are: (1) rent the telephone equipment you need from your telephone company; (2) install your own interconnect telephone system and lease it from the supplier or a leasing firm; or (3) purchase and install your own interconnect telephone system.

Must Make First of Two Choices

First a choice must be made between renting from the telephone company on the one hand and either leasing or outright purchase of an interconnect system on the other.

An Arcata executive points out that "the telephone company works on averages . . . and it performs outstandingly for the 'average' user. Each customer is put into a slot, and if the prospective user doesn't actually fit into a slot, he is forced into the nearest one. If a businessman's requirements fit this configuration, he has no need of interconnect. But if the user has unique requirements, he is wise to own his own system, designed especially for him. By accepting the overall 'average', in fact, he will lose, since his communications can never truly be efficient. The utility, after all, is required by law to provide the same quality of service to everyone . . . which may be an advantage for some, but not for businessmen.

By owning or leasing his own system, the businessman assures himself of an identifiable fixed cost instead of a never-ending rental charge for public utility equipment . . . which increases periodically."

Bob Cady, vice president and general manager of the uniquely-named The Other Telephone Company, gives some idea of the cost trade-offs in the three tables presented on this page, each analyzing a different way of acquiring a seven-line, 27-call selector system. Figure 1 shows cumulative annual savings based on an outright cash purchase of the system at a cost of $14,500 . . . the cumulative annual savings at the end of 10 years being $39,461.55. Figure 2 shows the net monthly savings with a five-year purchase plan . . . which would yield cumulative savings at the end of 10 years of $27,823.20. And Figure 3 shows the net monthly savings with an eight-year purchase plan . . . which would yield cumulative savings at the end of 10 years of $23,704.08.

Basically, this first choice is a choice between the dollar savings and equipment features offered by the interconnect company on the one hand and the equipment features and superior service capability of the telephone company on the other.

	Annual Cost of Lines	Annual Cost of Coupler	Cost of System	Annual Maintenance	Depreciation	Tax Savings	Total Annual Savings	Cumulative Annual Savings
1	$1,474.68	$487.44	$14,500	$486.00	$5,220.00	$2,871.00	$(6,961.84)	$(6,961.84)
2	1,474.68	487.44	—	486.00	1,856.00	1,020.80	5,687.96	1,273.88
3	1,474.68	487.44	—	486.00	1,484.80	816.64	5,483.80	4,209.92
4	1,474.68	487.44	—	486.00	1,187.84	653.31	5,320.47	9,530.39
5	1,474.68	487.44	—	486.00	950.27	522.65	5,189.81	14,720.20
6	1,474.68	487.44	—	486.00	760.22	418.12	5,085.28	19,805.48
7	1,474.68	487.44	—	486.00	608.77	334.49	5,001.65	24,807.13
8	1,474.68	487.44	—	486.00	486.54	267.60	4,934.76	29,741.89
9	1,474.68	487.44	—	486.00	389.23	214.60	4,881.24	34,623.13
10	1,474.68	487.44	—	486.00	311.39	171.26	4,838.42	39,461.55

FIGURE 1—Projected ten year savings assuming outright cash purchase of new 27-call selector system for $14,500.

Then Make Second Choice

If this choice is made in favor of "going interconnect," then a second choice must be made . . . between outright cash purchase, an installment purchase, or a permanent lease arrangement.

In making this choice, you need the advice of your treasurer and your tax consultant. Today it is often more beneficial to lease equipment than to own it . . . because our tax laws have turned long-term leases into assets and capital investments into handicaps.

If cash flow demands or tax considerations seem to indicate leasing as a good choice, here are some of the advantages. First of all, leasing of any type provides a fine tax shelter. The lease becomes a business expense and as such is fully deductible. Second, the corporate balance sheet under the leasing concept looks better because rent is not a long term capital debt. Third, leasing can serve as a hedge against inflation. A contract with a well financed leasing company covers a span of many years. Under such circumstances, the expansion of telephone facilities can be done at any time without additional capital investment by the leasee. And fourth, the most important advantage of this procedure is that the use of corporate funds is not impaired; they are conserved even as you are taking advantage of the savings offered by an interconnect system.

	5 Year
Monthly Line Rental	$122.89
Monthly Coupler Rental	40.62
Monthly Maintenance Cost	40.50
Monthly Contract Payment	314.60
Proposed Monthly Cost	$518.17
* * * *	
Present Monthly Bell Cost	$592.94
Proposed Monthly Cost	$518.17
Net Monthly Savings	$ 74.77
Monthly savings after equipment is paid for	**$388.95**

FIGURE 2—With five year payment plan, ten year savings would be $27,823.20.

	8 Year
Monthly Line Rental	$122.89
Monthly Coupler Rental	40.62
Monthly Maintenance Cost	40.50
Monthly Contract Payment	239.25
Proposed Monthly Cost	$443.26
* * * *	
Present Monthly Bell Cost	$592.94
Proposed Monthly Cost	$443.26
Net Monthly Savings	$149.68
Monthly savings after equipment is paid for	**$388.95**

FIGURE 3—With eight year payment plan, ten year savings would slip to $23,704.08.

Why have so many businesses changed from Bell to UCS designed telephone systems?

tremendous advantages and dollar savings!

- Eventual ownership to eliminate monthly equipment rental fees which for most businesses run into thousands of dollars a year.
- Quarterly routine preventive maintenance checks, as well as nationwide 24-hour a day service by professionally trained UCS personnel.
- No installation or change-over charges.
- Installation dates that fit your needs.
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- No charge for extras, like colored sets or cordless switchboards.
- Switching equipment that fills a cabinet, not a room.
- More UCS systems installed and sold than any other interconnect company in the U.S.
- Reduces payroll dollars.

GET THE FULL FACTS on how a UCS Telephone System can start making your telephone an investment instead of a liability. Phone 703/362-3701 or write: Universal Communication Systems, P. O. Box 254, 1401 Municipal Road, Roanoke, Virginia 24002.

UCS™

UNIVERSAL COMMUNICATION SYSTEMS

A Division of American Motors Inns, Inc.
Roanoke, Va.

Circle 14 on Reader Service Card

Features to Check When Shopping for a PABX

What do you get when you fall in love . . . with an interconnect PABX and telephone system?

The offerings of the 27 interconnect telephone system suppliers listed in our "directory" on page 29 include more than 60 different service features.

To help you to know what features are available, we present below a brief "glossary" of interconnect PABX terminology:

ABBREVIATED DIALING enables fast dialing with less than half of the normal number of digits.

ADD-ON CONFERENCE, on an incoming trunk extended call, allows the called station (having placed the outside party on hold) to consult privately with another internal station and then add-on the outside party for a three-party conference.

ALARM CHECKING AND SENDING allows central-office personnel to dial an assigned number in the PABX and receive an indication if an alarm condition exists. An indication of alarm may also be sent to a remote location automatically if required.

ATTENDANT CONFERENCE allows the attendant to connect central-office trunks with internal stations.

ATTENDANT CONSOLE is a centralized operator position utilizing push-button keys for control and connection of calls.

ATTENDANT HOLD allows the attendant to place central-office calls on hold, pending further processing.

ATTENDANT SIGNALING enables, by a separate push button, a station user to signal the attendant and, when convenient, the attendant rings the station and seeks instructions.

ATTENDANT TRANSFER allows an incoming central-office call to be transferred from one station to another with the assistance of the attendant, by dialing a single digit or flashing the switch-hook to recall the attendant.

AUTOMATIC CALLBACK allows the station user, when he encounters an internal-station busy signal, to dial a single-digit number and hang up. When calling and called parties become free, both are automatically rung and connected.

AUTOMATIC NUMBER IDENTIFICATION identifies stations when placing toll calls to provide the customer a monthly breakdown of toll calls.

AUTOMATIC RECALL automatically alerts the attendant, after a specific length of time, to a camped-on or unanswered call completed through her position so that she might provide a status report to the calling outside party.

BUSY LAMP FIELD provides the attendant with a visual indication of busy status of stations.

BUSY OVERRIDE allows attendant entry into conversations in progress to announce important calls. A warning tone indicates third-party entry.

CALL BLOCKING permits the attendant to prevent any station or station groups from receiving any calls. When this feature is activated by the attendant, calls to the restricted stations are routed to the attendant, recorded announcement, or tone.

CALL FORWARDING automatically reroutes incoming direct-inward-dialing or CCSA calls direcly to the attendant when the called station is busy or, in some systems, when the called station does not answer within a prescribed time.

CALL SPLITTING enables the attendant to hold the central-office call at the console and consult privately with the called station.

CALL-WAITING DISPLAY provides a visual indication of trunk calls waiting to be answered.

CAMP-ON BUSY allows incoming calls to busy stations to be stored until the lines are free and then to be connected automatically without further assistance from the attendant.

CLASS OF SERVICE is the capability of assigning to stations a variety of restrictions on incoming and outgoing calls.

CODE-CALL enables the attendent and station users to dial an access code and a called-party code to activate signaling device with a coded signal. When the person being sought recognizes his code, he answers by dialing the answer code from any station.

CONFERENCE CALLING permits station users and one outside caller to talk to each other at the same time on a conference circuit. Conferees participate by dialing a designated number.

CONSULTATION HOLD enables a station to call another station while placing the original incoming or outgoing outside call on hold.

DIAL INQUIRY enables a station, while engaged in an outside conversation, to make an inquiry to another station or outside number, while placing the outside party on hold.

DIAL TRANSFER allows a called station to transfer incoming calls to another station without attendant assistance.

DICTATION ACCESS makes available a group of dictation trunks which are dial-controlled by station users.

DIRECT INWARD DIALING permits PABX stations to be assigned directory numbers and to be dialed directly from the public telephone network without attendant assistance.

DIRECT OUTWARD DIALING permits each station to have access to outside central-office dialing without attendant assistance, by dialing an access digit.

DIRECT STATION SELECTION allows the attendant to place or complete incoming calls by depressing a push button for each desired internal station line.

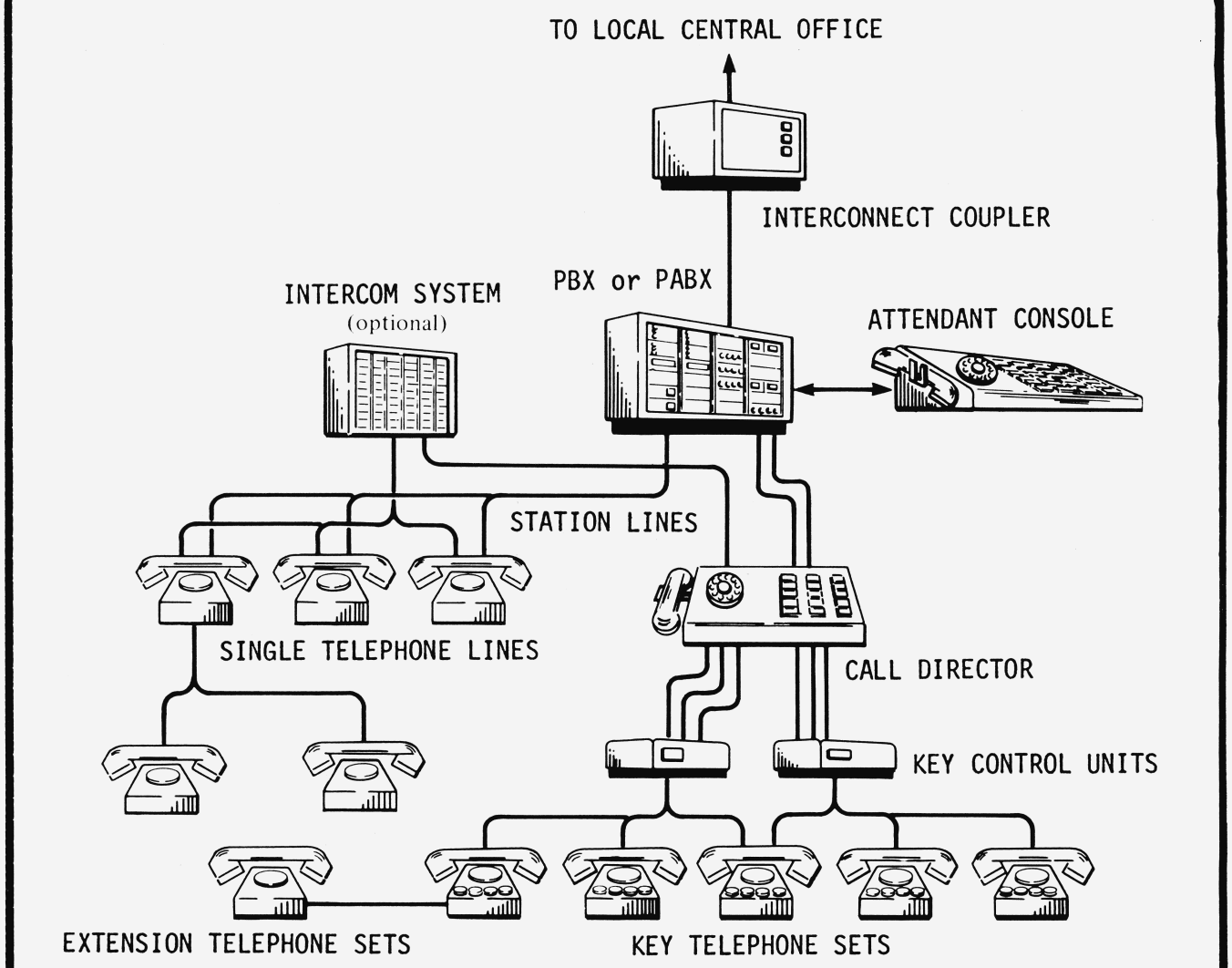
EMERGENCY REPORTING SYSTEM allows any station user to dial the access code for the system. A number of prearranged stations are designated as emergency lines and will ring continuously until answered. The system can be equipped so that busy lines may be overriden.

EXECUTIVE RIGHT-OF-WAY permits selected stations to override an existing conversation and gain access by dialing an additional digit after receiving busy tone. A warning tone is provided to parties engaged in conversation.

FAULT INDICATIONS provide visual indication on attendant console of fault in the system.

GROUP HUNTING provides for automatic selection of an idle line from a group of extensions. When a called extension is busy, a free line is connected without additional dialing.

A Typical Interconnect Telephone System



Source: *Creative Strategies*

HOWLER ALARM provides a "howler" tone to be sounded automatically at the station to prompt corrective action, in the event an idle handset is left "off hook" for a given period of time.

INTERCEPT routes calls intended for unassigned or changed (vacant) numbers to attendant, or sometimes to busy signal or recorded announcement.

LINE LOAD CONTROL blocks groups of stations from originating any type call, while being permitted to receive calls. This blocking occurs automatically when an overload condition develops, and the system returns to normal when the overload subsides.

LINE LOCKOUT allows the line to go on lockout and the common control equipment to be released if a station experiences line trouble or leaves the receiver off-hook for more than a specific number of seconds without dialing.

LINKS are circuits available for internal station-to-station calls. Sometimes called "junctors," they do not provide internal station acess to trunks (unless they are optional auxiliary link circuits).

LOCAL-CALL REGISTERS automatically record the number of outgoing local calls made on any extension that are not placed by the attendant.

LOCKOUT denies the attendant the ability to reenter an incoming central-office call, unless recalled by the station user.

MESSAGE-WAITING LAMPS incorporated on each station telephone indicate that a message is waiting at the main desk or other central location.

MUSIC/MESSAGE ON HOLD provides music or a recorded message to an incoming caller placed on hold.

NIGHT TRANSFER, PREDETERMINED, enables prearranged stations to receive incoming central-office calls directly when the attendant is not on duty.

NIGHT TRANSFER, UNIVERSAL enables incoming central-office calls at night to be answered from any nontrunk-restricted station by dialing a specific digit.

RANDOM NUMBER ASSIGNMENT means that numbers assigned to stations need not correspond directly to line terminal number, and a station user changing location within the system may retain his extension number.

RESERVE POWER provides alternate, independent source of power to maintain limited operation during power failure.

SEQUENCE CALL allows incoming calls to be connected in sequence to more than one station. The attendant arranges the connection for automatic recall when the station hangs up.

SERVICE-CALL DIALING permits single-digit service codes to be assigned frequently called PABX stations.

STATION-TO-STATION DIALING permits internal-station users to dial other internal stations directly, without going through the attendant.

STEP CALLING makes possible, when the desired station is called and found busy, to call another station in the same group merely by dialing the last digit.

TANDEM TRUNKING permits the attendant to connect an incoming trunk to an outgoing trunk.

TENANT SERVICE allows more than one organization to share the same PABX system, each with its own attendant console, lines, trunks, and links.

TERMINATION OF ALL CALLS provides answering of calls at preassigned stations if attendant's turret is busy.

TIE TRUNKS interconnect two PABX systems by dialing a specific number.

TOLL TICKETING provides a printout of all toll calls, including station number, time of beginning and end of call, and date.

TONE DIALING allows multifrequency push-button phones as well as rotary-dial phones to be installed at any station location.

TRUNK RESTRICTION prevents designated station users from placing outgoing central-office calls.

TRUNK-TO-TRUNK CONSULTATION allows a station connected to an outside central-office, tie, foreign-exchange, WATS, or other trunk to gain access to a second outside trunk for consultation, but not for conferencing.

VOICE PAGING allows the attendant and station users to have dial access to a paging system.

WAKE-UP SERVICE permits the attendant to alert automatically a group of station lines in sequence or simultaneously and to provide a recorded announcement or connection to the attendant when the station is answered.

WATS SERVICE allows station users to access special trunk groups assigned for Wide Area Telephone Service.

And to help you to know just what features are standard and/or optional in what PABX systems offered by what manufacturers, we present on the following pages the first complete guide to the interconnect PABX market ever printed . . . another *Communications News* exclusive.

New Cabinetized PABX Systems–25 to 400 lines.

Reliable has a variety of communication systems with standard features not previously available in packaged PABX's —such as automatic attendant recall. And 34 specialized options are available. We also have a nationwide network of qualified distributors ready to install, service and maintain your Reliable PABX. Contact us for the full story.

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Communications News Exclusive Guide

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* INCLUDES TWO-WAY TRUNK TOTAL
S STANDARD
O OPTIONAL
X AVAILABLE
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E ENGINEERED BASED UPON TRAFFIC LOAD OR CUSTOMER'S REQUIREMENTS

Supplier	Model	Description							
		Lines	TWO-WAY TRUNKS	ONE-WAY OUTGOING TRUNKS	TIE TRUNKS	INFORMATION TRUNKS	PAGING TRUNKS	LINKS (OR JUNCTORS)	DIAL "1" TRANSFER LINES
Arcata Communications	CP-100	2000	256	*	0	S	0	128	64
	CUSTOM KEY	50	20				0	3	
	561	275	40	*	0	S	0	20	6
	741	50	14	*	0	S	0	6	2
Erricsson-Centrum	ARD 561/2	90-270	40	0	0	0	0	20	6
	AKD 741/3	50	14	0	0	0	0	6	2
	CP 100	125-2000	16-256	0	0	0	0	12-128	4-64
GTE Automatic Electric	20B	20						5	
	L55-B4/200	200/120						15	
	TAS-100	100			0			15	
	25M	25				½		3	S
	40B	40			0	2		6	S
	80A	80			0	4		12	S
	40M/80M/100M	40/80/50			0	2/4		6/12/60	
	40KS/80KS	40/80						6/12	
	100T	400			0	4		15	S
	301	60+			0	4		12+	S
	311	U			0			U	S
	320	60+			0	9		12+	
Hitachi	AX2S (C5-3)	600	60	128	128	2	128	128	128
	AX3S (C6-7)	4800	1280	1280	1280	1280	1280	1280	1280
	DAX1 (C2-15)	100	21	32	32	2	32	32	32
	DAX1 (C2-18)	100	21	32	32	2	32	32	32
Information Dynamics	230A/B	30	5/10		1	5/10	1	4/6	5/10
Interconnect	100	20-100	4-12	0/6/8	0	1	0	4/6	
	403				X				
	404				X				
	409	400	8-12	4-20	0	2-6	0	6-18	
	HOTEL/MOTEL				X				
ITT CESD	A-1 CENTREX	24,999	20%	10%	10%	48	24	20%	10%
	P-600	50	10	10	2	1	1	4	2
	P-1000	10,000	20%	10%	10%	48	24	20%	10%
	TE-400A	100	24	24	12	2	6	12	6
Litcom	CB-240	90	20	E	E	1	E	6	2
	CB-440	600	20-30	18	E	2	E	18	4
	CB-500	100-1000	10-90	10	E	8	1	33	10
NEC	NA120	40-120	20		6	2	2	10	2
	NA4-09 (PBX/CTX)	100-400	28	24	10	6	4	18	6
	NA4-09 (H/M)	100-600	34	20	10	6	4	22	
	NG403 (PBX/CTX)	4,500	E	E	E	E	E	E	E
	NTC4-404 (PBX/CTX)	16,000	E	E	E	E	E	E	E
Norelco	UH30	30	5	E	E	E	E	4	E
	UH45	45	8	E	E	E	E	6	E
	UH300	300	37	E	E	E	E	36	E
	UH900	900	80	E	E	E	E	108	E
	UH1600	1600	120	E	E	E	E	192	E
Northern Telecom	PULSE EPABX	80	30			(24)	2	(24)	
	SE-2 PABX	200	37			5	4		4
OKI	AC-120	90	20		0	S	0	6	2
	AC-150	60	15			S	0	5	2
	AC-220	400	30	18	0	S	0	20	6
	AC-250 AC-250B AC-250H	600 - 1000	44 90	10 - 40	0	S	0	23 - 33	0 - 10
Plessey Communications Systems	PL-805	40-60	10-15		0			4-5	
	PL-810	30-90	5-20	5-20	0			3-6	
	PL-820	100-400	10-16	6-24	0				
	PL-850 PL-850H	100-1000	12-90	5-40	0	2-8	1- 2-4	10- 31	2-10
RCA Service	AC 120	90	20			1		6	E
	AC 150	60	15			1		5	E
	AC 220	400	54			3		20	E
	AC 250 B/H	800/1000	100			3		33	
Reliable Communications Products	CE-10	45-100	10-16	E	E	E	E	5-10	E
	CB-12	25-85	12-20	E	E	E	E	4-8	E
	CG-19	45-100	8-19	E	E	E	E	5-10	E
	1223	50-200	8-30	E	E	E	E	6-24	E
	1246	150-400	16-60	E	E	E	E	16-48	E
	48/100	50-100	12-48	E	E	E	E	6-12	E
Rollins Communications	NEC NEPAX-100 (SEE OTHER NEC EQUIPMENT ABOVE)	20-100	4-12	0/6/8	0	1		4/6	
Stromberg-Carlson	CROSSREED 400A	400	28	28	28	28		12	0
	CROSSREED 800	800	78	78	78	78		36	0
	PABX-E	10,000	480	480	480	480		U	0
Tele/Resources	T/R SYSTEM 32 (ALSO SEE OKI AC-120/220/250 ABOVE)	164	28		U	3	U		
Teledyne Tele-Systems	TEL 240H	60	20	6	X	1	1	6	2
	TEL 440H/C	660	36	18	X		1	20	4
	TEL 500C	1000	80	18	X		10	30	8
United Business Communications Systems	FXB-106U1	80	16	5	4	1	2	5	4
	FXB-304U1	700	24-68			2	2	18	6
	FXB-506U	800	108			10	2	36	
	FXB-800U	180	200			15	2	E	E
	ARD-561	210	35			1	1	20	6
	AKD-741	50	14			1	1	6	2
	NX-2	3000	E	E	E	E	2	E	E
Universal Communications	AX2-S	1200	60	40	E		E	32	60
	DAX-1	100	12	20	E		E	7	12
Wescom	501 PABX	120	E	E	E	2	E	24	

to the Interconnect PABX Market

| ORIGINATING REGISTERS | STATION-HUNTING GROUPS | ATTENDANT CONSOLES (Max.) | EQUIPMENT CABINETS | Features: ABBREVIATED DIALING | ADD-ON CONFERENCE | ALARM CHECKING AND SEND | ATTENDANT CONFERENCE | ATTENDANT HOLD | ATTENDANT SIGNALING | ATTENDANT TRANSFER | AUTOMATIC CALL BACK | AUTOMATIC NUMBER IDENT | AUTOMATIC RECALL | BUSY LAMP FIELD | BUSY OVERRIDE | CALL BLOCKING | CALL FORWARDING | CALL SPLITTING | CALL-WAITING DISPLAY | CAMP-ON BUSY | CLASS OF SERVICE | CODE-CALL | CONFERENCE CALLING | CONSULTATION HOLD | DIAL TRANSFER | DICTATION ACCESS | DIRECT INWARD DIALING | DIRECT OUTWARD DIALING | DIRECT STATION SELECTION | EMERGENCY REPORTING | EXECUTIVE RIGHT-OF-WAY | FAULT INDICATIONS | GROUP HUNTING | HOWLER ALARM | INTERCEPT | LINE LOAD CONTROL | LINE LOCKOUT | LOCAL-CALL REGISTERS | LOCKOUT (ATTENDANT) | MESSAGE-WAITING LAMPS | MUSIC/MESSAGE ON HOLD | NIGHT TRANSFER, | NIGHT TRANSFER, UNIVERSAL | RANDOM NUMBER ASSIGNMENT | RESERVE POWER | SEQUENCE CALL | SERVICE-CALL DIALING | STATION-TO-STATION DIAL | STEP CALLING | TANDEM TRUNKING | TENANT SERVICE | TERMINATION OF ALL CALLS | TOLL TICKETING | TONE DIALING | TRUNK RESTRICTION | TRUNK-TO-TRUNK CONSULT | VOICE PAGING | WAKE-UP SERVICE | WATS SERVICE |
|---|---|---

What to Do Until the Doctor Comes

The larger interconnect companies pride themselves on service. They recognize they are in the service business. Arcata Communications, for example, guarantees to deliver a serviceman within a maximum of three hours in an emergency situation.

To this the local telephone company representative is apt to answer: "We'll have a man there in *three minutes!*"

Service, certainly, is the achilles heel of the interconnect industry . . . the area which, rightfully or not, worries prospective customers the most . . . and the area which, admittedly, is the toughest nut for the interconnect supplier to crack.

And the cost of maintenance and service is probably the most difficult factor to accurately assess when evaluating an interconnected telephone system. Unlike the cost of leasing a system from the telephone company (with all maintenance included in the monthly rate), the price of an interconnected system usually does not include maintenance beyond a warranty or guarantee. The customer must either maintain it himself or sign a separate maintenance contract.

Can Figure Eight Percent for Maintenance

The factors that comprise the maintenance cost include: labor, including all benefit costs; materials and supplies; replacement parts; storage and work room; tools and test equipment; and transportation, if required.

Over the life of a telephone system, the average annual cost of these items can vary from six to 12 percent of the installed equipment cost. Most people regard eight percent as an acceptable, conservative figure.

It is important to realize, tho, that maintenance costs tend to increase substantially over time and that it may not be accurate to assume that the cost of an initial one or two-year maintenance contract will be repeated over the life of the system. And inflation will be a factor in these costs . . . probably more than in the telco rates one is comparing costs against.

If you own and operate your own telephone system, what do you do until the doctor comes?

Normally, telco repairmen won't touch pieces of "foreign" equipment. Most phone companies intend to apply a $15 "false alarm" charge if they are called for service and the trouble turns out to be in the privately owned equipment. An AT&T spokesman says: "Suppose a customer reports trouble and we send out a repairman to investigate? If he finds that our equipment is not at fault and the trouble can be traced to the customer, then a charge will be made for this visit. We are putting these repair call provisions into the local tariffs."

All of the leading interconnect PABX suppliers are putting heavy emphasis on service as they build their organizations. "In all cases," says Norelco's Art Bedder, "Norelco assumes full responsibility." UBC's Bob Liepold adds: "If a company can't do as good or a better job than the telephone company in servicing, then it shouldn't install the equipment!"

Interconnect Users Enthusiastic About Service

Communications managers of companies which have installed their own telephone systems tend to be enthusiastic about the service aspect.

Two years ago the Pioneer American Insurance Company in Fort Worth, Texas installed its own telephone system . . . a UBC ARD-561 system. Today Forrest Veal, vice president of Pioneer American, says: "The system has had very little down time in the two years we've had it. And UBC's service has been there when we need it. The managers here at Pioneer American feel they have a good investment and we would recommend anybody to take a serious look at interconnection."

Chicago's Precision Paper Tube Company had Arcata put in a system they feel is saving the company $13,000 a year. Precision Paper Tube President R. L. Hatton says: "Arcata service has been excellent. Service personnel have been in our plant in a maximum of 45 minutes from the reporting of a problem. We have found the Arcata Communications service personnel to be well trained, most experienced, and above all interested in their work."

Edcor Safety, a Kansas City-based safety equipment supplier, had UBC put in an FXB-106U system. Commenting on the system's cut over, Bob Horwitz, vice president, said, "We have had absolutely no problems with our system. The service has been fantastic! The UBC people have been top-notch in their performance. I would recommend them highly to anyone."

Herb Granger of American Express (see story, page 18) recounts this experience: "During my negotiations with management for approval to install customer owned and maintained telephone systems, I stressed that support was the major criteria in the selection of a supplier. On the 10th day after the Atlanta cutover I found out first-hand what this support commitment meant, because our TE400 died dead! Upon notification, in addition to their local service people, our supplier dispatched technical staffs and replacement parts simultaneously from their New York headquarters and Illinois factory. Additional technical support with expertise in the specific area where the trouble was located was also flown in. The problem was defined as a factory wiring error which passed improper currents through a portion of the system and subsequently burned out a transformer. As a precaution, our supplier on his own, chartered a plane and flew down a complete replacement TE400 unit equipped to our Atlanta specifications. The unit, although not needed, was left there until Divisional management was satisfied that the trouble was as diagnosed. Fortunately, or unfortunately, as the case might be, our chief engineer was on site when the system went down. He was very quick to quote the statistics I'd previously given him about the system's reliability and so on. I was just as quick to remind him that I'd also stressed support from the supplier. Within two weeks after that fated day, the chief engineer asked that the Springdale contracts for the next system we wanted to install be taken to the division vice president for authorization of the project. Need I say more?"

Some Questions You Should Consider

Anyone contemplating switching from telco service to ownership and maintenance of his own telephone system should consider these questions:

- *What happens if there is a commercial power failure? Will your system continue to operate? What is the cost of stand-by power?*
- *If you move your offices, who will move your communications system, and at what cost? Will you be out of service during the move? Who will do the planning?*
- *How long will it take a serviceman to get there and fix a minor problem? How about a major system failure?*
- *If your equipment is damaged by fire or flood, does your supplier offer disaster restoration? How fast can it be done? How much will it cost?*
- *Is maintenance included in the total purchase or lease / purchase price? If maintenance isn't included, exactly how much will parts and labor cost? Have you checked the cost of such contracts after the first few years?*
- *What kind of training has your maintenance representative had? Will his training continue? How many maintenance men are employed by your supplier? Where are they located?*
- *What do you know about the supplier you are dealing with? Can he help you tomorrow—ten years from now? How long has he been in the communications business? Have you considered what will happen if the supplier's business fails?*
- *What does the warranty cover . . . and for how long? What will it cost for parts not covered by the warranty? What happens if your equipment doesn't perform as promised? Has your attorney checked your contract to see if the terms of performance are spelled out?*
- *Does your supplier have the resources to help you with a tough communications problem that requires technological know-how? Will you get professional communications counseling as part of your purchase? If not, how much will it cost?*
- *How often in the past year have you had to add or change equipment? Will you have this same requirement next year? Will you be able to arrange such changes easily? How much does it cost to add communications equipment? Disconnect it? Move it?*
- *What happens if you have a reduction in your communications needs? Are there penalties for removing equipment that you're not using?*
- *If you should need repairs, what are the hours of your maintenance representatives? Can you get 24-hour emergency trouble service? Do you pay overtime charges?*
- *Are all the parts and supplies you will need readily available? Locally? Will you get components specifically engineered for your system or will you get stock hardware items? Will spare parts be available in 5 years? 10 years? 15 years?*

Suppliers Must Build Service Reputation

Small fly-by-nights do get into business, installing systems they never intend to service. But they don't survive. The more interconnect companies who concentrate on giving fast dependable service, the more industry as a whole will benefit.

Here are four steps anyone considering an interconnect proposal should take:

(1) Check the telephone expertise of your supplier . . . making sure that he has been making and servicing telephone equipment long enough to know what is needed.

(2) Check the financial stability of your supplier. You want to be sure that he will be in business five, ten, even twenty years from now.

(3) Establish his nationwide service capability . . . and check in particular detail the local service organization with whom you would be dealing.

(4) Check on the back-up your supplier will offer. You should expect: consultation to define your exact requirements, complete engineering of your system, installation of all equipment, coordination with the local telephone company, acceptance testing of the system, attendant and station user training, maintenance for the first year, maintenance training of customer personnel (if you want it), and availability of continuing consulting assistance and advice, when needed.

A quality telephone system installed by a capable company will not require many "house calls" by service "doctors." Modern telephone equipment is perhaps the most reliable of man-made mechanisms. And when trouble does trouble you, you will find that the service offered by the leading interconnect suppliers is not bad . . . and getting better by leaps and bounds.

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Circle 20 on Reader Service Card

What Can Happen to a Telephone Line?

Many people see a parallel between other utilities and the telephone companies. The electric company, they say, brings electricity to your building . . . and you then attach whatever you want, be it a computer or a hot comb. The gas company, they point out, pipes gas to your building . . . and you attach stoves, heaters, furnaces, and fireplace log units at your pleasure. Even the water company, they add, doesn't care whether you are washing or flushing!

Why should the telephone company be concerned, they ask, about how many and what kind of telephones, data sets, facsimile machines, and other communications instruments you attach to the lines they bring to your premises?

Telephone Service Is a Two-Way Thing

There is no real parallel and no valid analogy. Electric, gas and water utilities bring their product to you in a *one-way* system for you to *consume* on your premises . . . and they can measure by meter exactly how much of their product you consume, charging you accordingly. The telephone company, on the other hand, simply connects you as a station on *their* network, their wires not only bringing messages *to* you but also carrying messages you want to send *out* . . . to other stations in *their* network.

It is this *two-way* aspect of telephone communications that makes the interconnect issue a thorny one. And there are really two aspects to the dilemma now faced by the telephone companies because of interconnect.

One aspect is the rate area. How can telephone companies be adequately compensated for providing the marvelous message switching network . . . if some customers own their own telephone system and some do not? What rates are "fair" . . . when some customers are multiplexing many messages over the lines they lease and others aren't? Some thoughts on this rate area . . . and on the implications of widespread interconnection . . . are expressed in the article on page 26.

Must Protect Integrity of the Network

The other aspect is the possibility of harm to the network . . . a purely technical consideration.

What damage can be done to a telephone line . . . be it an ordinary #19 gauge pair, a 100-pair trunk, or a coaxial cable . . . or, thru it, to vital switching apparatus?

The answer is, apparently, not much.

Carbon blocks and surge arrestors make it virtually impossible to do damage to telephone company equipment thru any pair or pairs.

Other arrestors similarly protect virtually all outside plant segments of telephone cable, altho there could be a hazard to a person working on a section of cable if there were no arrestor between the workman and the station where someone maliciously used some non-communications device to put a heavy voltage charge in the line. This hazard, tho, is in the same probability category as the danger of a sniper's bullet . . . and can hardly be held as a valid argument against interconnect.

What it really boils down to is "protecting the integrity of the communications network" . . . against spurious voltages which could cause "noise" and "crosstalk".

At present hard-wired interconnection to the switched telephone system is permissible only when accomplished by means of a connecting arrangement and, as required, by a network control signalling device furnished at a charge only by the telephone company.

Whether these latter restrictions are reasonable or not has not been decided by the FCC. They have been accepted, at least temporarily, as necessary and realistic while the FCC takes a look at other possible alternatives. This is because of the concern . . . concurred in by a National Academy of Sciences study . . . that uncontrolled hard wire interconnections could have adverse affects on

the safety and functioning of the telephone network.

But Bernard Strassburg, chief of the FCC's Common Carrier Bureau, points out that: "There is widespread dissatisfaction with the connecting arrangements imposed by the revised tariffs. Independent manufacturers and distributors argue that the arrangements are onerous, unnecessary and economically burdensome. They contend that they are placed at a competitive disadvantage with the telephone company and are at the mercy of the latter for timely installation of suitable connecting arrangements.

"For the past year or more, two FCC-created advisory committees have been wrestling with the formulation of standards and enforcement procedures. A major hangup within the committees has been in trying to agree on the specific nature and degree of harm to which the network would likely be exposed by interconnection and from which the network must be protected.

Should Not Impose "Worst Case" Restraints

"It appears clear that only the telephone companies are in the most favorable position to gather this type of essential data. Despite the fact that the Commission has asked Bell and other carriers to provide us with these data, it has not yet been supplied. The Bell System should now undertake an objective survey to determine the extent of illegal interconnection and the incidence and character of actual as opposed to theoretical harm. Without such information it is difficult to assess the credibility of AT&T's claims with respect to actual or potential harm. If the potential impact of harm to the network is as central to the issue of liberalized interconnection as Bell contends, Bell is obligated to supply the necessary data or abandon its dogmatic position that interconnection requires standards and procedures of the utmost vigor. Or, to put it another way, if the carriers do not view this matter of sufficient importance to collect the necessary data, then certainly we can question the basis for the strong concerns they voice.

"While we are earnestly concerned with protecting the network from harm, we must avoid the imposition of "worst-case" restraints and costs premised upon unsupported apprehension."

Total Key System Market

TOTAL KEY SYSTEM MARKET
(10 to 40 Lines)

	Units	Lines	Sales
1971	7,300	146,000	$ 87.7 million
1972	7,700	154,000	92.5 million
1973	8,100	162,000	96.3 million
1974	8,500	170,000	102.0 million
1975	8,900	178,000	106.8 million
1976	9,300	186,000	111.6 million

Source: *Creative Strategies*

PABX Key Systems

KEY SYSTEM INTERCONNECT MARKET
(10 to 40 Lines)

	Units	Lines	Sales
1971	219	4,380	$ 2.6 million
1972	385	7,700	4.6 million
1973	810	16,200	9.6 million
1974	1276	25,550	15.3 million
1975	1780	35,600	21.4 million
1976	2790	55,800	34.8 million

Source: *Creative Strategies*

The Case Against Illegal Attachments

Today there is widespread marketing and advertising of terminal devices for direct "hard-wire" connection in violation of existing tariffs. These devices have not been qualified under a certification program since none now exists and there is evidence that few, if any, of the devices are being connected through telephone company-provided protective coupler arrangements.

This proliferation of "illegal" interconnect threatens to pollute the telephone network and may make any future certification program impossible to implement or enforce.

National mass media . . . including television . . . are being used to advertise these devices and illegal connection is being openly advocated. For example, the recent full page "Wall Street Journal" advertisement for the "Name-Caller" states, "You can easily install the Name-Caller yourself. No special parts or telephone company serviceman is required . . ."

The FCC's Bernard Strassburg says, "Some industry sources estimate that illegal interconnects are running in the several millions. Nevertheless, we have very little documentation from AT&T as to either the performance or the number of illegal interconnects or their effects on the network and Bell has devised no program by which to obtain such data. Our concern is not only with the alleged number of illegal interconnects, but also with the growth rate of such installations. We share the general concern that uncontrolled hard-wire interconnection, if continued unchecked, would produce harm to the telephone system. Telephone subscribers have a duty to conform to the applicable tariff conditions until they are properly changed or run the risk of losing their service. This is so whether they regard the tariff as unnecessary, unfair or economically burdensome.

Commission Has No Obligation to Act

"The Commission has no obligation under the Act to provide resources to enable the carriers to enforce tariffs. Instead, the telephone companies have the prime obligation under the Communications Act to police and enforce compliance with their tariffs. Otherwise, they run the risk of being in violation of their statutory obligations and being exposed to penalties and forfeitures. It is our duty to impose such forfeitures upon the carriers when they fail to enforce their tariffs and to award damages upon complaint to persons suffering from such failure and to grant other forms of relief. This is particularly true if enforcement of a tariff provision is not even-handed enforcement and results in discrimination and preferences among customers. If it is impossible, impractical or undesirable for the carriers to administer their tariffs in an effective manner, then the validity of the tariffs is in question and revisions should be initiated.

"We are also concerned with many advertisements of interconnect equipment such as automatic dialers, answering devices and telephone instruments that fall short of disclosing full information that the prospective purchasers should have. Some of these advertisements are silent with respect to the tariff requirement for rental of a telephone company connecting arrangement that must accompany use of the equipment; others state that there are no such requirements and others are ambiguous and incomplete in this respect. Whether this is false or misleading advertising or an unfair trade practice in a legal sense is not within the purview of the Commission's authority or expertise. The matter has been brought to the attention of the Federal Trade Commission and, perhaps, more will have to be done in this direction.

FCC Urged to Convene Special Meeting

Henry Marcheschi, president of American Telecommunications Corporation, has urged the FCC to convene a special meeting of representatives from telephone companies, state regulatory agencies, and interested manufacturers for the express purpose of implementing an immediate program of corrective action. Says Marcheschi: "We contemplate such corrective action including the acceleration of meaningful tariff enforcement with the unqualified backing of regulatory agencies and the implementation of legislation at state and national levels to the extent it may be required.

"In light of these examples and similar events, we respectfully suggest that failure to promptly implement corrective action will result in the following consequences:

"Unless the alarming trend of grossly accelerating interconnection absent of certification or other controls is reversed, serious harm will be caused the telephone network as concluded in the NAS study.

"The national advertising of telephone-related devices for "hard-wire" connection through mass media is conditioning the buying public to believe any interconnection, irrespective of telephone company tariffs, is permissible. Such prior erroneous conditioning of the marketplace may make it extremely difficult, if not impossible, to implement a viable certification program in the future.

"Tens of thousands of American consumers are now unknowingly purchasing devices that will not qualify for interconnection following implementation of a certification program. Further, many retailers are not aware of the potential liabilities that may be associated with the sale of such devices assuming pending certification programs would cause them to be unacceptable for use in the future. If for no other reason, the need to protect the consumer and unknowing retailer from such consequences mandates early action by the FCC and state regulatory agencies to correct the problem.

"If equipment manufacturers are allowed to profitably sell telephone terminal equipment without incurring the economic costs of certification, few, if any, manufacturers will purposely put themselves at a competitive disadvantage. Failure to enforce current tariffs is establishing a precedence for many manufacturers which will be difficult, if not impossible, to overcome in implementing and enforcing a future equipment certification program."

May Be 6,000,000 Illegal Interconnections

The number of telephone devices being connected contrary to existing tariffs has now reached significant and potentially harmful proportions. In the case of telephone answering devices alone, it is conservatively estimated that over 1,500,000 units fall into this category. Adding to this the estimated "illegal" interconnection of other terminal devices such as standard telephones, decorator telephones, automatic dialers, call-transfer devices and conferencing units, it is projected that a total of at least 6,000,000 devices are now "hard-wire" connected to the telephone network in violation of existing tariffs.

In recent months there has been a marked increase in the number of new terminal devices being offered for "hard-wire" connection throughout the country. These offerings promise to grossly accelerate the rate of "illegal" interconnection to appreciably higher and even more concerning proportions. Of particular importance is the use of national mass media, including television, to advertise the devices, and the blatant use of advertising copy which leaves no doubt the devices are to be "hard-wire" connected.

Mass merchandisers such as Montgomery Ward and Sears, Roebuck are aggressively moving into the sale of foreign-made decorator telephones and telephone answering devices. The distribution potential of such mass merchandisers is far greater than the distribution capacity which heretofore has already produced a highly concerning number of "illegal" interconnections. Further, the established high reputation of these retailers is tending to "legitimatize" interconnection in the eyes of many of the retailers who heretofore have needed the recommendations of the telephone companies.

Two major manufacturers of telephone terminal equipment, including a telephone answering device and an automatic dialer, which heretofore had religiously adhered to a policy of either selling to telephone companies or in strict accordance with interconnect tariffs, are now aggressively marketing their devices on a national basis for "hard-wire" connection.

Damned If They Do, Damned If They Don't

Hank Marcheschi is concerned about the allegation that certain regulators in fact favor unlimited interconnection and do not believe in the necessity of protecting the network as recommended by the NAS study. "If the allegation is true," says Marcheschi, "then the hundreds of thousands of man hours being expended in good faith to evolve a viable interconnection program are a total waste, and it is respectfully suggested the farce be ended. We have every reason to believe and hope the allegation is not true and that therefore the need to stop the alarming growth of illegal interconnection will be considered by regulatory agencies as a concern of the highest priority."

It would be an overly simplistic solution for regulatory agencies to look solely to the telephone companies to stem the tide of "illegal" interconnection. Recent attempts by telephone companies to enforce interconnection tariffs have resulted in numerous restraint of trade and anti-trust actions being filed against the telephone companies. Thus, those primarily responsible for tariff enforcement find themselves in the untenable position of being "damned if they do, and damned if they don't." To further complicate matters, it has not been altogether clear whose cause certain regulatory agencies have championed in such litigation.

EASY INSTALLATION
You can easily install the Name Caller yourself. No special parts or telephone company serviceman is required and complete instructions come with each unit.

Circle 22 on Reader Service Card

Is a Certification Lab the Answer?

The same National Academy of Sciences study which concluded that network protection is essential also suggested an alternative to telephone company imposed arrangements, namely, a system of prescribed standards for customer owned and maintained equipment, including a program of enforced certification of such equipment as well as certified installation and maintenance.

Many, including Communications Consultant Donald Dittberner, have called for a laboratory comparable in the communications field to the Underwriters Laboratory in the electrical field.

And, as a matter of fact, a former utility commissioner, Amos Jackson, has already established (and is president of) his own Communications Certification Laboratory with offices in Salt Lake City, Utah.

And Jackson himself is quick to squelch any comparison with Underwriters Laboratory. Says Jackson: "Well, now, there's a significant difference between the electrical field and the communications field. In the electrical field the commodity leaves the network and is consumed on the premises. In the communication field, at the point of interface there is some of the commodity going both directions. The network addresses the station equipment and the station equipment addresses the network. There is a closer similarity in the trucking industry and there is a comparable organization to UL in the trucking industry. It's a laboratory under the auspices of ATA (American Truckers Association) and that laboratory does some tests and they've created some standards and they have filed these standards with the regulatory commissions throughout the fifty states and with ICC nationally."

Must First Set Standards

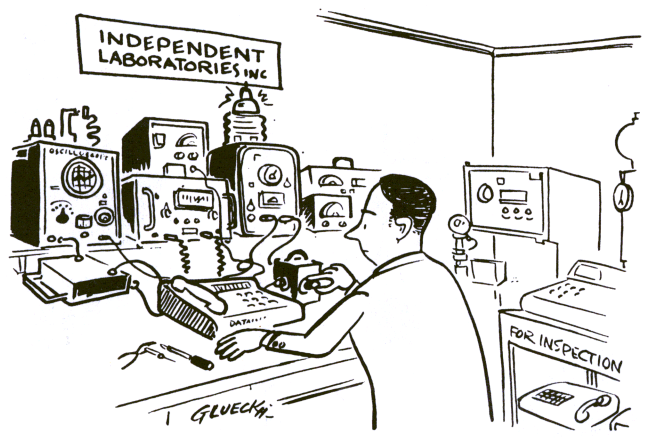
Before certification can be meaningful in the interconnect arena, several things must happen: First, standards must be set. It is assumed that the standards for the design of PBX equipment would assure adequate protection of services provided over the switched public network and to the carriers' employees. Such standards would have to include testing methodology, measurement procedures and required instrumentation to assure that, to the extent feasible, discretion would be removed from the testing function and that the testing laboratories would be performing a mechanical activity within detailed and finite parameters. The FCC's Bernard Strassburg observes: "The degree of protection required will determine the cost effectiveness and viability of any such program. AT&T contends for standards and procedures that would give maximum safeguards against types of harm that many non-carriers regard as highly remote and more theoretical than real."

Must Decide on Board Make-Up

Second, *a board must be named.* The FCC PBX Advisory Committee, for example, recommends that as an outgrowth of their work there be a continuing body entitled the "Interconnect Board" which would be chartered and appointed by the FCC with approximately 11 members having staggered terms, that membership including representatives of the FCC, the National Association of Regulatory Utility Commissions, the telephone companies, the PBX manufacturers, the interconnect companies, and users. On the other hand, Clay Whitehead, White House Director of Telecommunications Policy, has taken the position that such a board should "consist of affected industry representatives and prominent public leaders selected without reference to federal agencies, and should contain no representation by federal or state regulatory bodies."

Must Set Up Testing Lab

Third, *a testing laboratory must be established.* The PBX Advisory Committee recommends that the actual test-



ing of equipment for compliance with standards be performed by non-governmental agencies. This recommendation is made on the assumption that reputable testing authorities can be found which will perform this function in a timely and economical manner. The committee sees funding as being provided through applicants' fees.

Must Establish Testing Procedure

And, fourth, *a certification procedure must be established.* The PBX Advisory Committee is currently advocating that in cases where direct cut through by the PBX between the CO trunk and the station equipment is provided, only certified station equipment may be connected. However, certification will not be required for station equipment that is connected to PBX systems that are certified to serve as an adequate barrier to potential harm.

The Testing Laboratory would issue a document of certification, and the Interconnect Board would publish a list by manufacturer and type and certification numbers of that equipment and the form of certification that has been granted. Thereafter, such equipment, unless modified or certification subsequently revoked, could be connected to the network. The Interconnection Board could request subsequent testing of certified equipment if operational data shown non-compliance with standards or the equipment has been modified in some material respect. It is anticipated that the tariffs of all carriers would be revised to provide that equipment which had been certified by an approved agency could be attached by direct electrical connection to the public switched network.

Inspection Will Be Major Problem

Inspection and policing would, of course, be the major problem . . . and proper equipment maintenance the real root of that problem.

A woman may buy a UL-approved toaster, take it home, and plug it in. Sooner or later it malfunctions . . . but all that happens is that the toast burns or, at worst, a fuse blows. Not so with a defective telephone or answering device.

Policing Will Be Achilles Heel

When a communications device . . . even tho "CCL-approved" . . . goes bad, crosstalk or noise may be fed into other lines in the network . . . and the user may be totally unaware of the problem he is causing.

Some sort of certification program will help to establish interconnect . . . but the Achilles Heel will always be the impossibility of adequately policing what's going on at 130 million stations!

Total PABX Market

(20-3000 Lines)

	Units	Lines	Sales
1971	7,150	930,000	$465 million
1972	7,380	960,000	480 million
1973	7,650	995,000	497 million
1974	7,920	1,030,000	515 million
1975	8,180	1,065,000	533 million
1976	8,450	1,100,000	550 million

Source: *Creative Strategies*

Interconnect PABX

	Units	Lines	Sales
1971	1,160	116,000	$ 55 million
1972	1,500	158,000	79 million
1973	1,700	188,000	95 million
1974	1,850	210,000	105 million
1975	1,960	227,000	114 million
1976	2,050	250,000	125 million

Source: *Creative Strategies*

$36,000,000 a year in R&D for ideas like PULSE—the most advanced electronic private automatic branch exchange. With Northern Telecom's PULSE, a business subscriber gets only the extensions, trunk lines and features he wants. But, additional options can be plugged in on-site as required.

No need for a special equipment room, either. Decorator-designed PULSE is compact and quiet. Compatible with your telephone system. And efficiency-engineered for busy switchboard receptionists.

PULSE. An advanced new development. From an advanced company: Northern Telecom. The United States subsidiary of Northern Electric Company, Ltd., of Canada. Ninety years of experience in meeting North American needs.

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- Pacific: 1106 Broadway, Santa Monica, Calif. 90401, (213) 451-8623
- Southeast: 5601 Mariner St., Tampa, Florida 33609, (813) 879-7070
- Southwest: 2822 Walnut Hill Lane, Dallas, Texas 75229, (214) 350-6896
- Northeast: 140 Federal Street, Boston, Mass. 02110, (617) 482-0995
- Central: 2951 Higgins Rd., Elk Grove Village, Ill. 60007, (312) 437-2370

Building better ways to keep in touch

NORTHERN TELECOM

How the Telcos Are Fighting Back

Telephone companies do not intend to give up any portion of the telephone market without a fight. And, with the 100th anniversary of Alexander Graham Bell's life-changing invention just four years away, the 25 Bell and 1800 Independent telephone companies are in a strong position to fight . . . with both experience and expertise on their side.

"It is our determination," says AT&T Chairman John de Butts, "to remove any doubts . . . among our customers, among our competitors, among our selves . . . as to whether we really intend to compete. We must. To anybody and everybody who will listen, I have said again and again that we don't intend to abdicate any sector of our business . . . not the terminal area, not the private line area . . . where we are convinced (and can, by our performance, prove) that we can do a better job than anybody else."

Expanding on his reaction to interconnect competition, de Butts declares: "If we go down that road, service is going to deteriorate. I agree that many people can make just as good equipment as Western Electric. The big problem is maintenance.

"How are you going to force customers to maintain the terminal gear so it won't adversely affect the quality of service to other customers? That's the kind of problem we would run into.

"AT&T and the other telephone companies don't sell hardware but total end-to-end service. If anything goes wrong with modems, switchboards, and other terminals attached to telephone lines, the telephone companies can be held responsible. If you go to certification and allow a customer to connect anything he wants to buy without any protection to the telephone network service problems will follow."

A Shotgun Wedding!

Three conditions have tended to distinguish the communication industry in the past. These include: first, a practice of owning and leasing equipment to subscribers; second, the policy of holding ownership interest in equipment suppliers and manufacturers; and finally, a practice of taking equipment and hardware requirements from their supply affiliates. Each of these policies has conditioned the structure of telecommunication equipment for several decades.

Actually the much-heralded "Carterfone Decision" was not the sole cause of the shotgun-wedding between the blushing "bride" of customers owning their own telecommunications equipment and the rich and reluctant groom . . . the telcos.

Prior to World War II, the telephone industry's monopoly position as a supplier of communications services was not an issue. Telephone companies in North America did not allow customer-provided equipment to be interconnected with their facilities, and their Tariffs reflected this point-of-view. In fact, there was little demand for it. During the war, however, many industries built up a tremendous communications capability, and when the war ended, they began looking for ways to capitalize on their new expertise. As their markets developed, they began to challenge the telephone industry's right to refuse to interconnect customer-provided equipment.

One of the earliest successful challenges was the 1956 Hush-a-Phone case . . . involving a cup-like device which was claimed to provide privacy when attached to a telephone handset. The United States Court of Appeals for the District of Columbia ruled that a customer has the right to use his telephone "in ways which are privately beneficial without being publicly detrimental."

In February, 1957, the FCC directed Bell System companies to revise their published rules to remove the prohibition on connection of any device . . . including Hush-a-Phone . . . which does not injure telephone company employees or the public, or impair operation of the telephone system.

Things were relatively quiet for the next few years. Then, in 1965, came the widely-publicized Carterfone case involving a device used to interconnect private mobile radio systems with the telephone network by acoustic or inductive coupling. In June 1968, the FCC found the Bell System interconnection Tariffs unlawful and ordered them revised. The revised Tariffs, which became effective January 1, 1969, liberalized terms and conditions for interconnection.

As a result of this, and subsequent FCC decisions, telephone companies in the United States today find themselves in the position of having to permit almost unlimited interconnection.

Although a few telephone companies favor open interconnect . . . Rochester Tel being the most notable example . . . most telephone companies have policies (and tariffs) which follow these general lines:

- The acoustic or inductive connection to the network of customer-provided equipment and devices such as facsimile and electrocardiograph machines is permitted.
- The electrical connection of such things as answering-recording machines and alarm devices is permitted only thru a telco-provided interface device.
- Connection to the public switched network, through system connecting equipment, of customer-provided data terminals such as data sets, teleprinters and computers is also permitted.
- Use of inert equipment, such as shoulder rests and pencil holders, in association with the telephone is permitted.
- Use of customer-provided antique and decorator telephones, provided the working parts are replaced by the telephone company to ensure their compatibility with network control and signalling requirements, is permitted.

Telco Service Is One of Your Choices

Interconnection is a fact of life. The wedding has taken place. The user of communications has a *choice*. And the important thing for the user to remember is that he should not make any decision without thoroughly exploring the advantages of this choice.

Telephone companies will be competitive in three areas . . . rates, equipment, and service.

Telephone companies will undoubtedly meet the growing interconnect competition with new tariffs. Present "value of service" concepts . . . which result in businesses paying more for their telephone service than residential users do . . . may change. There will, undoubtedly, be changes in rate base and cost allocation. Telco rates may . . . relative to other costs . . . be lower in the future.

New York Tel, for example, is considering a number of rate-making approaches to try and fend off the competition, such as offering customer options on the method of payment (no installation charge with higher monthly rates, or installment payments on the installation charge.)

Telephone companies are already bringing out better equipment . . . to meet interconnect suppliers head on. Any equipment available to interconnect suppliers is available to Independent telephone companies. And Bell, thanks to a new Western Electric PABX manufacturing facility in Denver, is now bringing out many new systems . . . with shorter lead-time than ever before.

It is in the service area that telcos still . . . and probably always will . . . hold the most trumps (see "What to Do Until the Doctor Comes?" on page 22).

Some Questions to Answer

In evaluating the "choice" of continuing to rent your telephone system from your local telephone company, here are some questions you should consider:

- *What could you earn on the money you would spend to buy a communications system? Can you earn more by investing directly in your own business?*
- *How would your company's cash flow be affected by lease expense compared to a depreciation write-off?*

Pacific Tel's John Post says: "I think it is unfortunate that the telephone companies have sometimes created the impression that they are unalterably opposed to interconnection. Sure, we don't like to lose business any more than the next guy. And interconnection creates special problems for us in engineering and maintaining the quality of the telephone network. We do not believe the introduction of competition is a major, long-term problem for us. Far from it. We look upon it as a challenge. The telephone companies have the resources and the will to compete effectively in this market by providing the customer with the best equipment and services to meet his needs. As everyone knows, we don't sell hardware; we sell *service*. We've been in the business a long time and we are going to continue to be the leaders into the future with new and exotic communications innovations."

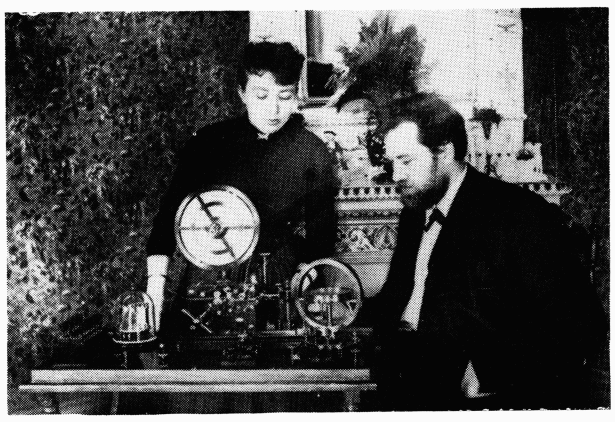
One of the women's magazines used to use as its slogan: "Never underestimate the power of a woman." Never underestimate the power of Ma Bell . . . both to compete and to render super communications service.

WE'RE OLDER THAN JUST ABOUT AND ABOUT FIVE YEARS AHEAD.

The same year Alexander Graham Bell received his first American patent for the telephone, the Ericsson Group was founded in Sweden.

At first, of course, it wasn't a very big company—just a two-man operation—but it quickly grew into one of Sweden's largest enterprises. Mainly because of one man: Lars Magnus Ericsson.

L. M. Ericsson, a thirty-year old engineer, saw a worldwide need for better, faster communications. So, he started his little company. With a lot of hard work, dedication, and one main purpose: To give the world the highest quality, best engineered communications equipment he could.



And he did.

We were, for example, the first communications company in the world to develop a desk model handset.

We were the first to manufacture telephones of a non-breakable plastic material.

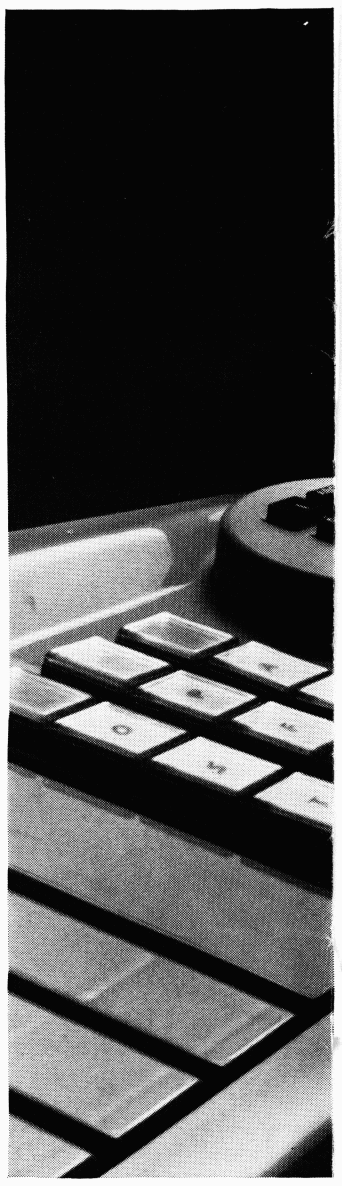
And the first to develop a commercially successful one-piece telephone—the Ericofon—at least five years before anyone else.

Way back in the forties, we developed the "crossbar" system, which has become the standard system of all phone exchanges throughout the world.

In the early sixties, an Ericsson-designed electronic switching system, the most advanced of its type, was delivered to the U.S. Air Force.

And in 1968, an Ericsson computer-controlled exchange was put into service in Stockholm.

Today, the Ericsson Group is one of the largest producers of telecommunications equipment in the world. And we can give the business community an office communications system that can do just about anything you can think of.



We have PABX systems with economical capacities of up to 9,000 extensions that can be equipped with automatic call back, control and metering of long distance calls, group calls, paging, central dictation, and tie lines, to mention a few.

We have modular PAX systems, equipped to handle up to twenty-five simultaneous calls.

We have hands-free intercom systems, from two to 5,000 lines, featuring the world's most advanced solid-state intercom exchange using TDM technique.

We have systems that can do almost

Interconnect Future in Hands of the Regulator

When all is said and done, the long-range future of the interconnect industry is in the laps of the gods . . . in this case the FCC and the fifty state regulatory agencies.

While a little interconnect action can be tolerated by telephone companies because it tends to silence "monopoly" charges, a lot is sure to bring aggressive competition from the carriers. And "competitive pricing" is their strongest weapon.

Up to a point, the communications user will be the big gainer in this competition. Prices will come down a bit and service and equipment will be improved.

Must Prevent Predatory Pricing

The basic question is, will the regulatory agencies permit what amounts to "predatory pricing" by telephone companies . . . permitting rates which do not have cost justification or represent subsidization by services not subject to competition.

The immediate and most obvious cost effects of interconnection are with respect to rate base, the investment upon which the telephone company is permitted to earn a return. The effects in this area will be both direct and indirect.

Neil Swift, director of the Communications Division of the New York Public Service Department, says: "Initially, the combination of present subscribers who switch to customer-owned equipment and new customers who decide against utility installation and ownership of equipment will result in the removal of existing installations and a decrease in future purchases of this equipment by telephone companies. The net effect of these circumstances will be a relative decrease in investment in several plant accounts. Each impact of interconnection on rate base results in a relative *reduction* in investment with a consequent *reduction* in revenue requirement.

However, apparent disproportionate operating costs related to terminal equipment may result in reductions in costs disproportionately greater than reductions in revenues.

Telephone companies generally have indicated their intention to compete vigorously with manufacturers supplying customer-owned equipment in an attempt to retain its traditional market and to attract customers to new terminal equipment markets.

The Bell System is undertaking the development of new station equipment, with particular attention to the PBX area, that will be directly competitive with foreign manufacturers. To this end it has established a task force, headquartered in Denver, Colorado, devoted exclusively to developing station equipment competitive with foreign models both in cost and service features. Presumably their efforts will be fruitful and the Bell System ultimately will obtain equipment from Western Electric competitive with equipment of foreign origin.

Several telephone companies have indicated that they intend to initiate new policies and procedures in their ratemaking approach. The revisions would include customer options on the method of payment . . . such as large installation charge to obtain lower monthly rates, no instalment payment of the installation charge.

Telephone companies are also considering the adoption of a "Long Range Incremental Pricing" approach rather than the fully allocated cost method presently used for establishing rates on station equipment. It is assumed that this method will be used in most instances to justify lower rates than would be indicated by the more traditional fully allocated cost approach.

If interconnect companies can profitably supply equipment at prices below the incremental costs to the telephone companies of providing comparable equipment, the market will go to the interconnect companies. If, on the other hand, telephone companies can meet the full costs of providing terminal equipment at a price lower than the independent suppliers, the market will ultimately go to the telephone companies. But the dilemma will face regulatory commissions if the lowest profitable prices of interconnect suppliers are less than the telephone companies' "fully allocated" costs of providing comparable equipment, but above the incremental costs to the telephone companies of providing such equipment. The problem of incremental pricing will have to be faced only if the telephone companies show that there is a substantial difference between the two . . . that is, that the provision of terminal equipment by the telephone companies results in economies of joint operation in that overhead costs do *not* increase in proportion to the amount of business telephone companies do in the terminal equipment market.

Interconnect Suppliers Have Sparked Progress

Regulators will also be confronted with problems arising from separations procedures and possible loss of telephone company profits in the provision of "vertical services" (imposing greater revenue requirements of the basic telephone user). The underlying issue is whether these problems should be met by attempting to suppress competition from interconnect equipment suppliers or whether the answers lay elsewhere . . . as in revision of "separations" procedures and in elimination of subsidies between different classes of service provided by telephone companies?

Regulators also may have to consider less than compensatory rates for existing station equipment if filed by telephone companies in order to avoid excessive supercedure of equipment in service. One question is: who should bear the losses incurred as a result of such non-compensatory rates. Should it be the other rate-payers, by including the uncovered costs in computing revenue requirements for other services? Or should it be the telephone company's stockholders, by requiring that the investment in obsolete equipment be written off against capital surplus until the book investment therein is low enough to make charges for such equipment "compensatory" when compared to the book value as thus written down?

The regulatory area is the important area to watch in the interconnect struggle. And it would be ironic and, by our reckoning, tragic if the interconnect suppliers, who have initiated and stimulated the development of better equipment, improved service and lower cost, were to be "done in" by telephone companies which could underprice them not because the telcos would be doing a better job of supplying terminal equipment but because part of their costs would be shared by other services. The user should have a "choice" . . . and the competition should be fair.

Interconnect Market Summary

	PABX Systems	Key Systems	Service	Subtotal	Attachments	Total
1971	$ 55,000,000	$ 2,600,000	$ 2,000,000	$ 59,600,000	$11,000,000	$ 70,600,000
1972	79,000,000	4,600,000	5,000,000	88,600,000	12,700,000	101,300,000
1973	95,000,000	9,600,000	8,800,000	113,400,000	14,800,000	128,200,000
1974	105,000,000	15,300,000	13,000,000	133,300,000	17,500,000	150,800,000
1975	114,000,000	21,400,000	17,500,000	152,900,000	21,000,000	173,900,000
1976	125,000,000	34,800,000	22,500,000	182,300,000	26,000,000	208,300,000

Source: *Creative Strategies*

The Interconnect Leaders

Market Shares Held by Leading Interconnect Suppliers (1971)

	Main Equipment Handled	Systems Installed	Lines Installed	Sales Millions	Share of Market
Arcata	Ericsson-Centrum Nippon Electric Oki & others	650	40,000	$18	36%
UCS	Hitachi	250	15,000	6.5	13%
ITT	ITT	110	9,000	5	10%
UBC	North, Fujitsu	200	10,000	5	10%
RCA	Hitachi, Oki	70	5,000	2	4%
Norelco	Philips	55	4,500	2	4%
Teleci	Hitachi	50	4,000	1.6	3%
Automatic Electric	Automatic Electric	35	2,500	1	2%
Tele/ Resources	Oki	30	3,000	1.2	2%
Others		300	20,000	8	16%
		1,750	113,000	50.3	100%

Source: *Frost & Sullivan*

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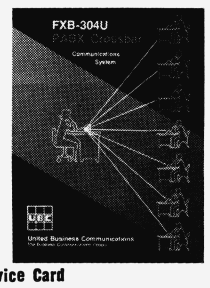
Circle 25 on Reader Service Card

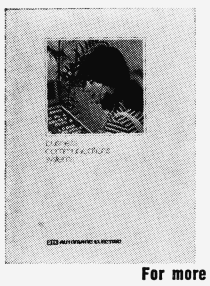
Interconnect Literature

TO OBTAIN any of the interconnect literature described below, simply circle . . . or write in . . . the appropriate number on the Reader Service Card opposite page 98.



SYSTEM BROCHURE describes and illustrates the FXB-304U PABX crossbar communications system for 100 to 400 line extensions. Dial "1" consultation transfer, standard and optional features, class-of-service arrangements, and system capacities and arrangements are discussed. Use card or write *United Business Communications, 6405 Metcalf Avenue, Shawnee Mission, Kansas 66202.*

For more info circle 222 on Reader Service Card

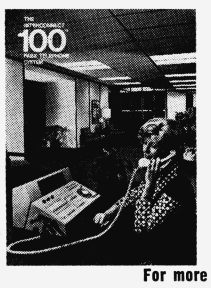


COMMUNICATIONS GUIDE presents a complete line of telephone and communication equipment. Standard features, installation, maintenance, training, how the communications specialist can help, and advantages of the company's equipment and services are discussed. Use card or write *GTE Automatic Electric, 400 North Wolf Road, Northlake, Illinois 60164.*

For more info circle 223 on Reader Service Card

SERVICE BOOKLET offers the Model ARD-561 PBX system for dial communications service ideal for the company requiring 270 telephones or less. Advantages such as outside dialing and direct-dial intercom, standard and optional features, illustrations, and specifications are provided. Use card or write *North Electric Company, Post Office Box 688, Galion, Ohio 44833.*

For more info circle 224 on Reader Service Card

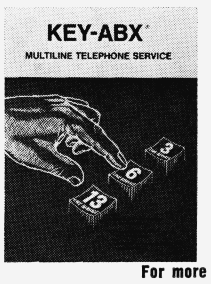


TELEPHONE SYSTEM LIT features the Model 100 PABX telephone system for operations requiring 20 to 100 extensions. System features, the console, benefits, a brief description of the company, optional features, and accessories are discussed. Use card or write *Interconnect Corporation, 7620 Northwest 36th Avenue, Miami, Florida 33147.*

For more info circle 225 on Reader Service Card

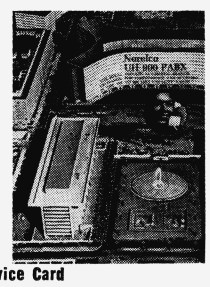
EQUIPMENT FOLDER describes and illustrates the NA120 crossbar PBX system for 40 to 120 lines offering package versatility and building-block module design. The folder covers standard service features, optional service features, construction, module requirements, and specifications. Use card or write *Nippon Electric Company, Suite 4321, Pan Am Building, 200 Park Avenue, New York, New York 10017.*

For more info circle 226 on Reader Service Card



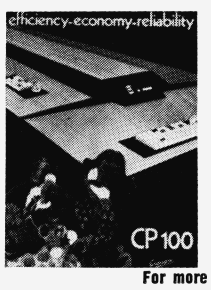
SERVICE BROCHURE discusses the company's products and services including multiline telephone service for up to three lines, up to six lines, and up to 13 lines. Illustrations, features, and specifications are provided for each service. Use card or write *Stromberg-Carlson Corporation, 100 Carlson Road, Rochester, New York 14603.*

For more info circle 227 on Reader Service Card



PRODUCT BULLETIN presents the UH 900 PABX for 100 to 900 line capacity range, available with or without Centrex operation. The bulletin includes advantages, information on expansion, KeyTone operation, and standard and optional features. Use card or write *North American Philips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

For more info circle 228 on Reader Service Card



EQUIPMENT BOOKLET describes the CP 100 crossbar common-control type of PABX with an initial capacity for 125 extensions which can be expanded to 1000 extensions. An introduction, standard facilities, add-on facilities, space requirements, and technical data are offered. Use card or write *Ericsson Centrum, 16 East 40th Street, New York, New York 10016.*

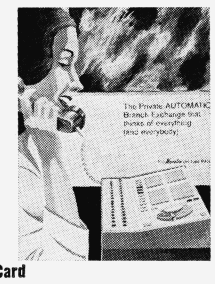
For more info circle 229 on Reader Service Card

PRODUCT LITERATURE describes and illustrates the Tel-Extenda Line Tel-500 communications system for the user who needs immediate access to his business, WATS, tie, or trunk lines, or private secondary telephone system. Complete features and specifications are included. Use card or write *Electronic Concepts Laboratories, 70 Hilliard Street, Manchester, Connecticut 06040.*

For more info circle 230 on Reader Service Card

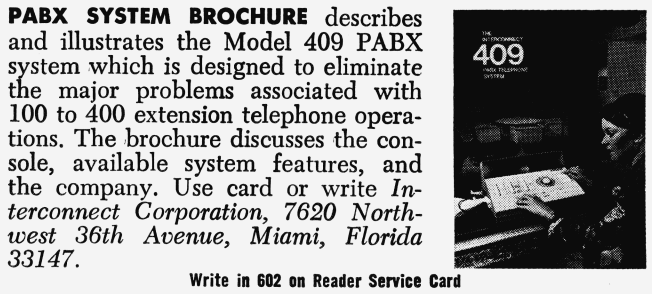
PRODUCT FOLDER covers the basic facilities and the add-on facilities of the AKD 741 PABX system for 25 to 50 extensions. Illustrations; information on capacity, performance, and other features; technical data; and advantages are provided. Use card or write *Ericsson Centrum, 16 East 40th Street, New York, New York 10016.*

For more info circle 600 on Reader Service Card



INSTRUMENT BULLETIN presents the UH-Type PABX which features busy-line camp-on, automatic series recall, transfer/consultation, and more. Other operator and extension user features are listed. Optional features and capacities are also included. Use card or write *North American Philips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

Write in 601 on Reader Service Card

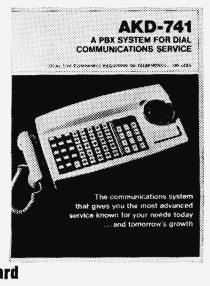


PABX SYSTEM BROCHURE describes and illustrates the Model 409 PABX system which is designed to eliminate the major problems associated with 100 to 400 extension telephone operations. The brochure discusses the console, available system features, and the company. Use card or write *Interconnect Corporation, 7620 Northwest 36th Avenue, Miami, Florida 33147.*

Write in 602 on Reader Service Card

CONVERSION-SYSTEMS SHEET details the UPB800 KeyTone conversion systems which add push-button service to existing relay, step-by-step, or crossbar CO's. Application advantages, standard and optional features, traffic analysis and capacity, and specifications are discussed. Use card or write *North American Philips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

Write in 603 on Reader Service Card



INSTRUMENT LITERATURE describes and illustrates the AKD-741 PBX system for companies requiring 50 telephones or less. The literature covers outside dialing, dial intercom, push-button control by attendant, standard and optional features, and specifications. Use card or write *North Electric Company, Post Office Box 688, Galion, Ohio 44833.*

Write in 604 on Reader Service Card

SYSTEM BOOKLET describes and illustrates the Type UH 900 private automatic branch exchange intended for organizations that require from about 150 to 900 extensions. System design, capacity, mechanical design, service classes, facilities, operation, and components are covered. Use card or write *North American Philips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

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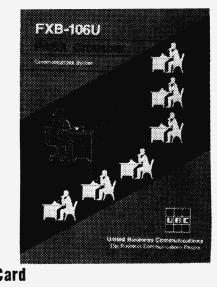

PABX-CROSSBAR-SYSTEM FOLDER features the Model FXB-106U PABX crossbar communications system. The folder discusses the attendant console, standard features, optional features, class of service, and general specifications. Use card or write *United Business Communications, 6405 Metcalf Avenue, Shawnee Mission, Kansas 66202.*

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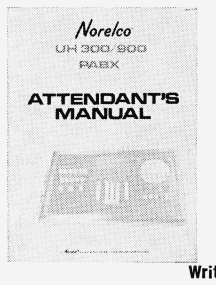

ATTENDANT'S GUIDE describes and illustrates the UH300/900 PABX. A quick-reference console guide; special situations; procedures including answering an incoming call, using attendant lines, and placing an outgoing call; and options are thoroughly discussed. Use card or write *North American Philips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

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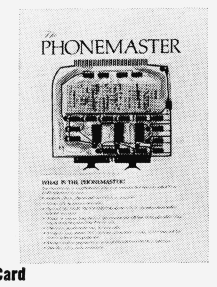

RESTRICTOR BROCHURE details the Phonemaster solid-state restrictor that operates with KTS or PABX telephone systems. What the phone-master does, the various models available, characteristics, warranty information, and a glossary of terms are provided. Use card or write *Phonetele, Incorporated, 15414 Cabrito Road, Van Nuys, California 91406.*

Write in 608 on Reader Service Card

ATTENDANT'S MANUAL presents the UH30/45 PABX featuring a night switch, buzzer switch, attendant keyset, and busy-lamp panel. Handling an incoming call, placing an outside call, the console reference guide and options are discussed. Use card or write *North American Philips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

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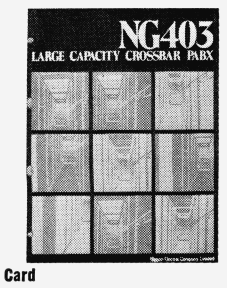

INSTRUMENT DATA SHEET features the NG403 large-capacity crossbar PABX that expands to any number of lines between 400 and 4,500. A general description, package features, optional features, specifications, and a list of the company offices are included. Use card or write *Nippon Electric Company, Suite 4321, Pan Am Building, 200 Park Avenue, New York, New York 10017.*

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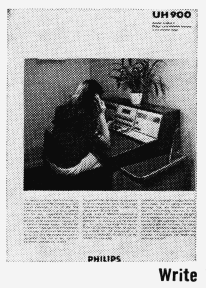

EQUIPMENT BROCHURE features the UH 900 PABX equipped for capacities between approximately 150 and 900 extensions. The brochure covers operation; advantages; features including conference service, direct key calling, and automatic transfer; and a photograph. Use card or write *North American Philips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

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JACK PANELS for 23" RACKS

Dimension same as Bantam above

PJ-738-23 Bantam Jack Panel (illustrated) is complete with 52 pairs (104) PJ-839 Jacks. PJ-739-23 Bantam Jack Panel is complete with 48 pairs (96) PJ-839 Jacks. The D-15999-P1 (231-A) Standard Jack Panel has 32 pairs (64) PJ-339 Jacks. Write for Bulletins 268-A, 364-A and 170-A describing these panels, Bantam and Standard Jacks, Patch Cords, Lamp Sockets, etc.

BUCKEYE TELEPHONE & SUPPLY CO.
1250 Kinnear Road, Columbus, Ohio 43221 • (614) 488-0655
540 Mt. Gallant Road, Rock Hill, S.C. 29732 • (803) 366-5121

Circle 26 on Reader Service Card

Interconnect PABX Directory

A.E.I. TELECOMMUNICATIONS (CANADA) LIMITED
419 Notre Dame Avenue
Winnipeg 2, Manitoba, Canada

ACTION/DICTOGRAPH PRODUCTS
34 Cambridge Street
Meriden, Connecticut 06450

ARCATA COMMUNICATIONS
850 Stierlin Road
Mountain View, California 94040

ERICSSON-CENTRUM, INCORPORATED
16 East 40th Street
New York, New York 10016

GE TELE-NORM
85 Sherwood Avenue
East Farmingdale, Long Island, New York 11735

GTE AUTOMATIC ELECTRIC, INCORPORATED
400 North Wolf Road
Northlake, Illinois 60164

HITACHI AMERICA LIMITED
437 Madison Avenue
New York, New York 10022

ITT CESD
60 Washington Street
Hartford, Connecticut 06106

INFORMATION DYNAMICS CORPORATION
1711 Dallas North Parkway
Plano, Texas 75074

INTERCONNECT CORPORATION
7620 Northwest 36th Avenue
Miami, Florida 33147

LITCOM DIVISION, LITTON INDUSTRIES
1770 Walt Whitman Road
Melville, New York 11746

NEC AMERICA, INCORPORATED
200 Park Avenue
New York, New York 10017

NORTH AMERICAN PHILIPS CORPORATION
91 McKee Drive
Mahwah, New Jersey 07430

NORTH ELECTRIC COMPANY
Post Office Box 688
Galion, Ohio 44833

NORTHERN TELECOM
140 Federal Street
Boston, Massachusetts 02110

OKI ELECTRONICS OF AMERICA, INCORPORATED
500 Southeast 24th Street
Fort Lauderdale, Florida 33316

THE OTHER TELEPHONE COMPANY
6975 Washington Avenue
Edina, Minnesota 55435

PHILCO-FORD
3885 Bohannon Drive
Menlo Park, California 94025

PLESSEY COMMUNICATIONS SYSTEMS
1413 Chestnut Avenue
Hillside, New Jersey 07205

RCA SERVICE COMPANY
Building 203-3, Department 1614
Camden, New Jersey 08101

RELIABLE COMMUNICATIONS PRODUCTS COMPANY
11333 Addison Street
Franklin Park, Illinois 60131

ROLLINS COMMUNICATIONS, INCORPORATED
5976 Old Peachtree Road
Chamblee, Georgia 30005

STROMBERG-CARLSON, INCORPORATED
Post Office Box 778
Rochester, New York 14603

TELECI, INCORPORATED
Post Office Box 18458
Memphis, Tennessee 38118

TELEDYNE TELE-SYSTEMS
19601 Nordhoff Street
Northridge, California 91324

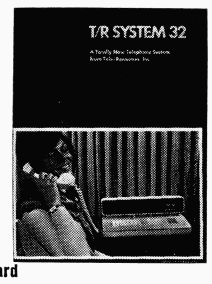
TELE/RESOURCES, INCORPORATED
1 North Broadway
White Plains, New York 10601

TELEPHONE COMPANY OF AMERICA, INCORPORATED
13735 Victory Boulevard
Van Nuys, California 91401

UNITED BUSINESS COMMUNICATIONS
6405 Metcalf Avenue
Shawnee Mission, Kansas 66202

UNIVERSAL COMMUNICATIONS SYSTEMS
1401 Municipal Road
Roanoke, Virginia 24002

WESCOM, INCORPORATED
501 Rogers Street
Downers Grove, Illinois 60515



SYSTEM FOLDER describes and illustrates the System 32 telephone system which consists of an operator console, single and multiline telephones, and associated electronic controls. The folder provides features, specifications, and a brief description of the company. Use card or write *Tele/Resources Incorporated, 545 Madison Avenue, New York, New York 10022.*

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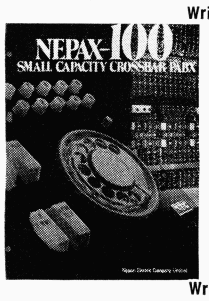

SMALL-PABX-SYSTEM BULLETIN includes complete specifications for the A type and D(B) type NEPAX-100 building block system for 20 to 100 extensions. Illustrations, package features, dimensions, and optional features are supplied. Use card or write *Nippon Electric Company, Suite 4321, Pam Am Building, 200 Park Avenue, New York, New York 10017.*

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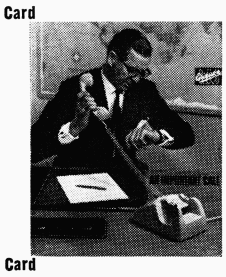

CROSSBAR-SYSTEM BULLETIN presents the Type ARD 561 PABX crossbar system. The bulletin covers basic facilities, add-on facilities, the operator's console, call facilities, advantages, and specifications. Use card or write *Ericsson Centrum, 16 East 40th Street, New York, New York 10016.*

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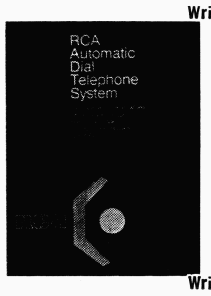
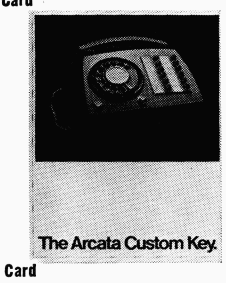


TELEPHONE-SYSTEM PAMPHLET describes and illustrates an automatic dial telephone system. Benefits, features, options, the attendant console, the crossbar switching system, and a lease plan are detailed in the pamphlet. Use card or write *RCA Service Company, Building 203-3, Department 1614, Camden, New Jersey 08101.*

Write in 615 on Reader Service Card

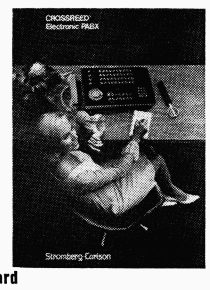


TELEPHONE FOLDER describes and illustrates the custom key telephone system which features automatic button restoration and individual, zone, or all-station paging. Other features and advantages, plus a list of regional offices, are included. Use card or write *Arcata Communications, 850 Stierlin Road, Mountain View, California 94040.*

Write in 616 on Reader Service Card

CALL-DIVERTER SHEET details the Trans-A-Call telephone-call diverter which transfers incoming telephone calls to any other local or long-distance telephone number set on the instrument. Applications, features, and technical specifications are covered. Use card or write *Electronic Concepts Laboratories, 70 Hilliard Street, Manchester, Connecticut 06040.*

Write in 617 on Reader Service Card

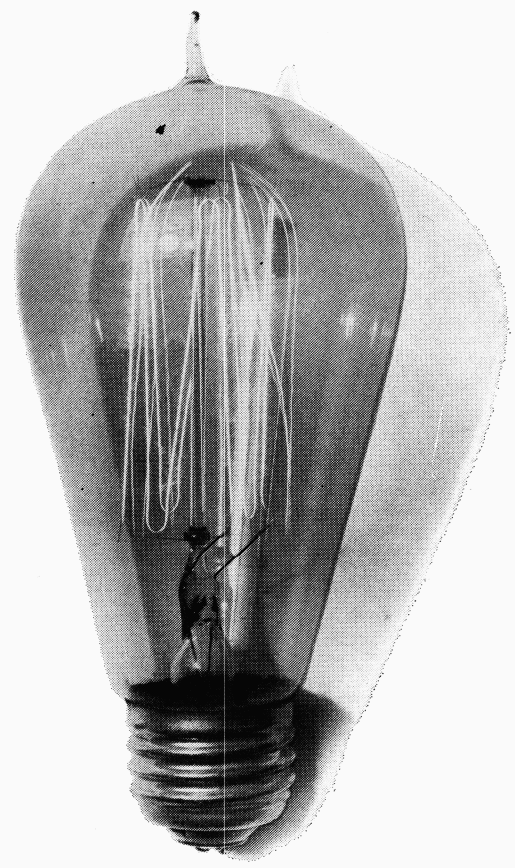


ELECTRONIC-PABX SHEET features crossreed electronic PABX systems including the 400A (100 to 400 lines), the 800 (400 to 800 lines), and the EPAPX-E (500 or more lines). Turret features, station features, system features, design features, and a selection chart are supplied. Use card or write *Stromberg-Carlson Corporation, 100 Carlson Road, Rochester, New York 14603.*

Write in 618 on Reader Service Card

If it wasn't for competition and a monopoly breaking government decision, your light bulbs would probably still look something like this. There was a time when you may have been required to buy light bulbs only from your local power company. Same was true for telephones. Until the famous Carterfone case in 1968, you had little choice but to have the phone company install your firm's telecommunications system. ☐ WHAT HAPPENED? Competition and innovation in the communications industry. Innovation has been rapid in coming. All of a sudden you can find new and improved automatic telephone systems. Costs are lower, and you can actually buy your own system. ☐ Teledyne Tele-Systems has all the resources to custom design your new communications system with expert installation and around-the-clock maintenance. Financing can be handled by Teledyne and, of course, customer service is part of the total communications package. ☐ We are dedicated to stamping out obsolescence by providing innovative, modern communications systems with guaranteed performance. ☐ Call us today or simply fill out and mail the coupon. ☐ Teledyne Tele-Systems "the full service communications company" 19601 Nordhoff Street, Northridge, California 91324, Telephone (213) 886-2211.

SEEN THIS LIGHTBULB AROUND LATELY?



"the full service communications company"

TELEDYNE TELE-SYSTEMS

SHOW ME
at no obligation what Teledyne can do for my company. Show me the light.

Name_____
Title_____
Company_____
Number of Telephones_____
Address_____
City_____ State_____ Zip_____

Circle 27 on Reader Service Card

Flying Tiger Line Finds CCTV Key to Security

For The Flying Tiger Line, the world's largest full-time carrier of air freight, security is its own reward. In this cargo carrier's daily operations, security is a conscious effort—not afterthought or happenstance.

Because FTL subscribes to the "security is its own reward" concept, it has significantly reduced theft and pilferage to unexpected lows at its import facility adjacent to John F. Kennedy International Airport. Closed-circuit television is given credit for a substantial part of the reduction.

Last year 21 million pounds of cargo from 28,500 shipments passed through the terminal. Flying Tiger has established a corporate goal that the claims rate—the claim dollar paid versus revenue charged to each terminal—should be less than three-quarters of one percent. In 1970, the rate at the JFK import facility was nearly eight percent. During the first half of 1972, the claims rate was reduced to less than one-quarter of one percent.

General Electric TE33B1 CCTV cameras are an integral component to the total security effort at Flying Tiger's new terminal facility. Twenty-four hours a day, cameras view the customs inspection area, loading docks, bypass area, breakdown section, security cage, and the small package section. From the guard tower, the security office, and the office of Jack Pierson, terminal operations manager, these areas can be monitored constantly.

A careful review of FTL s requirements was made by the Broadway Maintenance Corporation's New York City and Philadelphia offices, prior to installing the CCTV system. The flow of work inside the terminal and the various points where security would be most vulnerable were of utmost consideration to Stan Wickliffe of Broadway, manager of sales for their Electronic Systems Division.

Because most cameras would be positioned high in the ceiling of the terminal building, a camera was needed which would require little maintenance once it was installed. There was also a need for a hands-off camera that could operate under various extremes of temperatures and humidity.

Camera at Each End to Monitor All Areas

One GE TE33 camera was placed at each end of the main room so that all areas could be monitored by security personnel. An additional General Electric camera is mounted on a remote pan and tilt unit equipped with a remotely controlled 10-to-1 zoom lens.

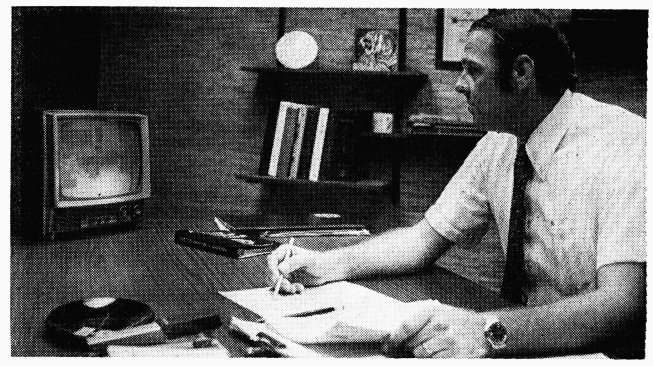
Single cameras monitor the customs inspection room and keep close watch on the security cage where all valuable cargo is secured by a positive control recording lock.

The case is opened only by key management personnel. Each time the lock is opened, the time, date, and key used is recorded automatically by electronic sensors. Each person opening the cage must sign his name and the reason for entering.

Single cameras also watch the area where small packages are kept and the general area where big containers are broken down into individual consignments.

The system also employs an Odetics time-lapse video recorder with a slow-scan audio feature which allows for review of any particular operation as desired.

The guard tower in the main terminal area monitors all pictures on individual screens. A similar set-up is maintained in the security office where the CCTV recording



Supervisor of Loss Prevention Jack Carroll checks activity throughout the terminal by viewing CCTV monitors in his office.

equipment is positioned. Pierson has a single monitor in his office so he can switch to view activity covered by any individual camera.

New York management for FTL set out to demonstrate that they could have the best record of any terminal in the Flying Tiger system. This decision was made about the same time that the United States Senate was conducting investigations into theft, pilfereage, and smuggling at airports around the nation.

Before closed-circuit television was installed by Flying Tiger in New York, losses there were running slightly ahead of standards established by the company for its terminals.

Recognizing that security is in a large part psychological and emotional, efforts were made to make security second-nature. Every effort was made to obtain the finest equipment available to provide necessary support of human efforts.

Security Is 70% Psychological

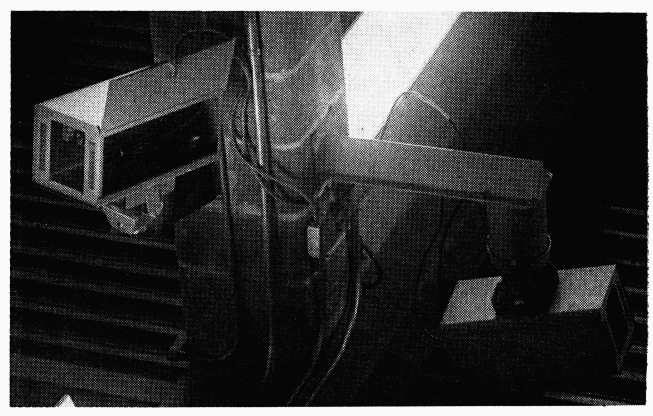
Long discussions with security and manufacturing consultants helped Flying Tiger's management develop a system of electronic surveillance, personnel awareness, and special procedures that produced dramatic results from the very day they were implemented.

"We believe that security is 70-percent psychological," says Pierson. "We advised people that we were taking strict security procedures; we expanded screening of new employees. They feel that many of these procedures are designed to make working conditions better and safer for them so they have been most cooperative.

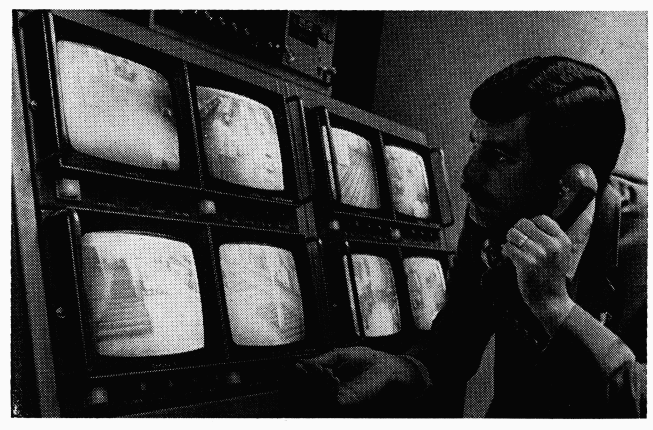
"We use private uniformed guards for providing 24-hour human surveillance of our terminal. All electronic and protective gear is also used 24-hours a day to provide double security. With the electronic gear we are able to make better use of uniformed personnel.

"We carefully inspect each cargo shipment and match the quantity with what the bill of lading says. Sometimes we detect a discrepancy between the original instructions and what is received; or perhaps a package was severely damaged. This is noted to the shipper, but he is not permitted to take an exception to the bill of lading. The driver is required to be there and double-check the piece count and condition of the shipment.

"FTL management is completely satisfied with their dollar investment in this new building," Pierson noted. "Their judgment in providing good equipment to supplement our guard force has paid off in better claims rates and many satisfied customers."



Two General Electric TE-33B1 CCTV cameras scan dock area. Cameras are contained in environmental housings with remote pan/tilt control.



Terminal Operations Manager Jack Pierson makes instant check of security and work load operations in terminal without leaving his office by switching the TV monitor from one camera to another.

Largest selling communications monitor in the FM world.

the Cushman CE-3

And there are good reasons why—proven, in-field performance; reliability; and time-saving versatility.

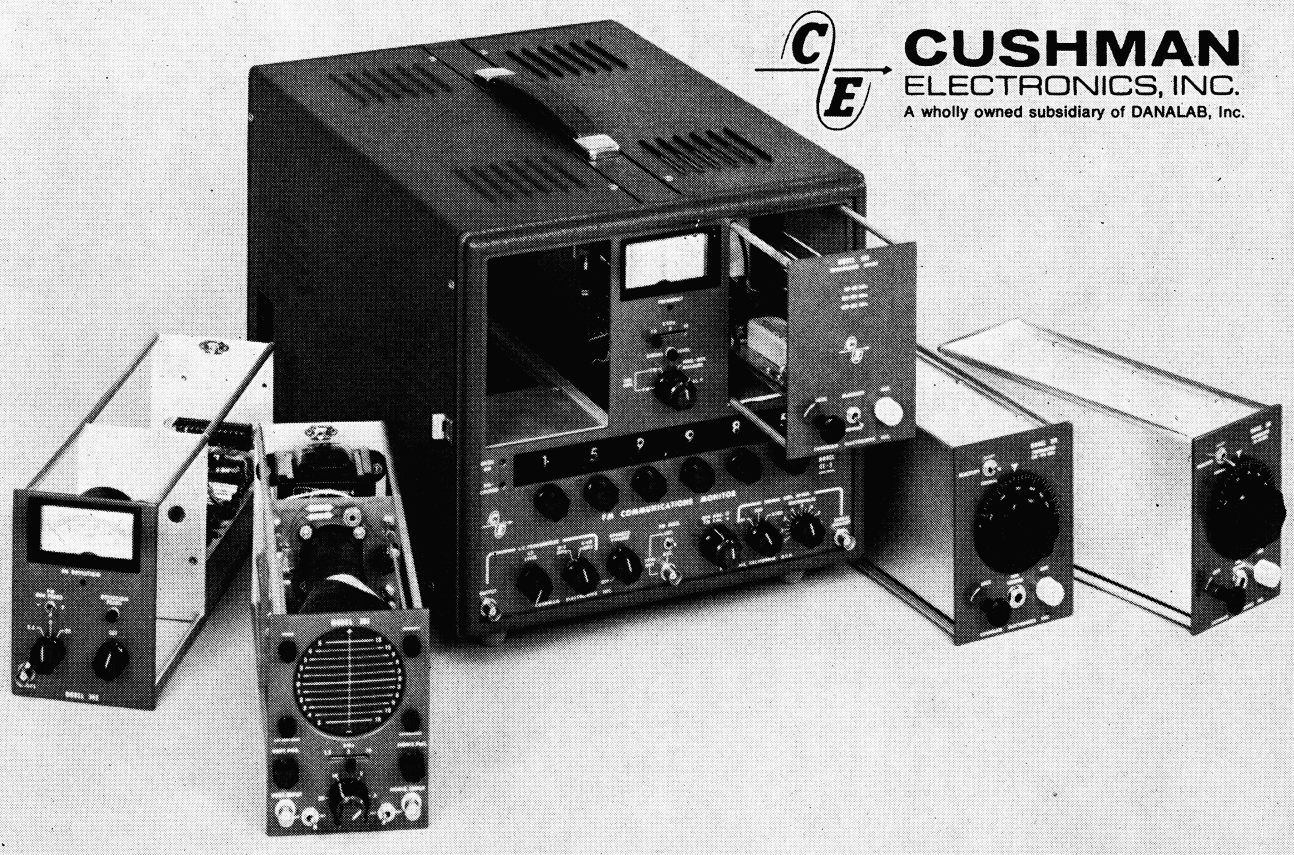
Since its introduction in 1969, more than 2000 CE-3's have been sold and are now in daily operation. And the number keeps increasing. That's proof of performance.

What's more, the CE-3 is the third generation of Cushman's "communications lab-in-a-box" technology: We've been making monitors for over 12 years. So, you know you're getting an instrument you can depend on.

As for time-saving versatility, nothing equals the CE-3. A complete family of plug-in modules—available now—and "dial-in" frequency selection enable one man and a CE-3 to:

- Measure FM deviation and frequency error simultaneously, with direct reading, over three bands: 20–80 MHz; 120–180 MHz; and 450–512 MHz (and 400–420 MHz with optional plug-in).
- Listen to incoming carrier modulation.
- Generate calibrated CW or FM signals.
- Monitor base stations up to 50 miles away.
- Identify interference sources.
- Troubleshoot receivers.
- Test tone-operated squelch circuits.
- Service closed-loop, 70 kHz to 150 MHz paging receivers.
- Check receivers and transmitters in the 2–4 MHz marine band.
- Make stage gain measurements in receivers.

So, when you want dependable, time-saving monitoring, specify Cushman. For full details and/or a demonstration, call your local Cushman representative or Cushman Electronics, Inc., 830 Stewart Drive, Sunnyvale, CA 94086. Phone: (408) 739-6760. In Canada: Tele-Radio Systems.



CUSHMAN ELECTRONICS, INC.
A wholly owned subsidiary of DANALAB, Inc.

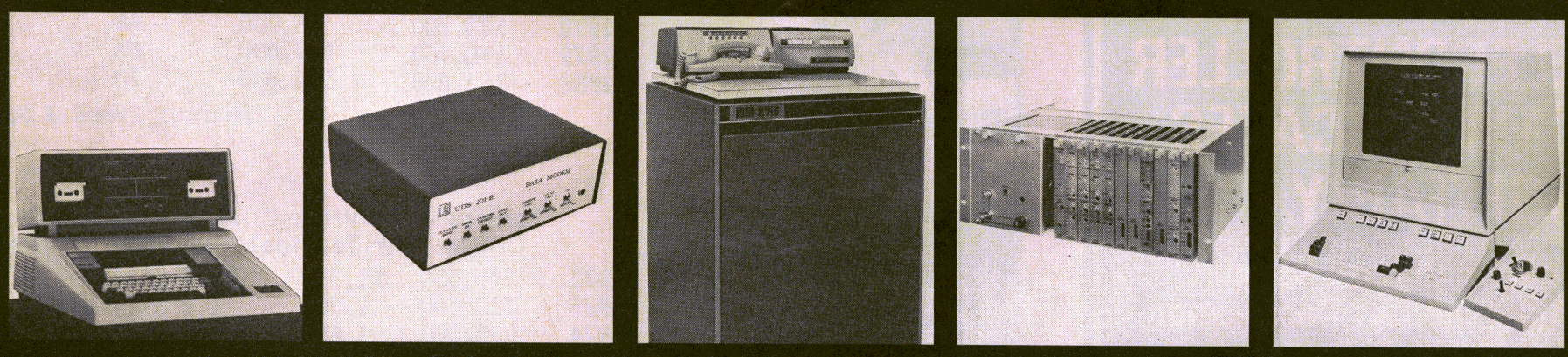
MANUFACTURERS OF PRECISION TEST INSTRUMENTS FOR THE LAND/MOBILE AND TELECOMMUNICATIONS SPECTRUM.

Circle 28 on Reader Service Card

COMMUNICATIONS news

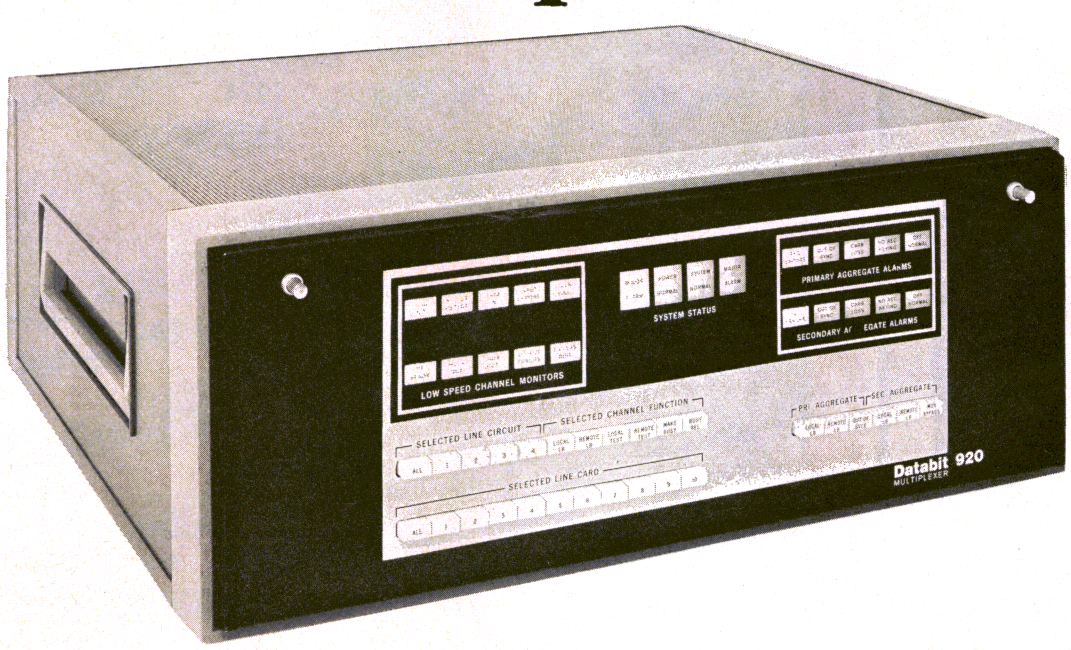
A special lift-out section!

Data Communications Special



AT THE FALL JOINT COMPUTER CONFERENCE this month out in California in the beautiful new Anaheim Convention Center, these and scores of other new data communications products will be on display. They are also "on display" in this exclusive CN special report on Data Communications . . . in the "exhibit on paper" which begins on page 58. Latest data communications market facts, helpful case histories and technical articles, several "how to" features, new product descriptions, and available free literature . . . all are included in this 40-page special report. Three handy Reader Service Coupons are provided on page 69 to make it easy for you to obtain the free literature offered.

The Unique TDM



• private networks
• remote access computer systems
• TELEX networks

We said unique . . . and we mean it. The Databit Model 920 TDM provides all the features and flexibility required by large systems operators, private networks and common carriers. To prove our point, let us tell you a little about the 920.

You probably know that polling systems on tandem channels are seriously degraded by character-interleaved TDM's due to the 4 character round-trip delay on each link. But bit interleave multiplexing in the 920 minimizes propagation delay. Read on.

Non-standard bit rates can be accepted by simple reprogramming in the field. A crystal controlled synthesizer generates any six arbitrary bit rates between 45 and 1,200 baud. Moreover, efficiently mixed speeds provide greater channel capacity.

There's a lot more to the 920. Like the fact that dial-up "handshaking signals" may be passed through the TDM to a central computer.

Or that TELEX signaling compatibility, both dial pulse and keyboard, is a standard feature.

And maintenance is aided by the most extensive, yet concise, monitoring facilities available on any TDM now in production.

We should mention cost . . . it's surprisingly low.

Finally, you'll notice we called the 920 unique . . . we didn't call it new. Why? Because the 920 has been in operation in the field for over a year. Thousands of channels are now in service carrying a mixture of TELEX and leased channels.

Yes, the Databit 920 is the unique TDM. And there's much more to know about it. Get the whole story. Call or write Databit Inc., 93 Marcus Blvd., Hauppauge, N. Y. 11787. (516) 231-5005.

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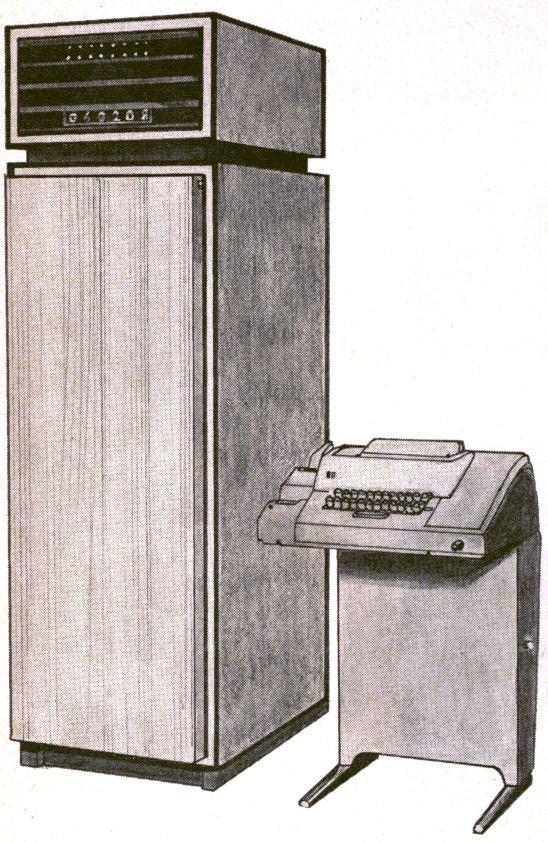

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The Data Communications Market

Computers in Use

	Computers in Use	Computers with Terminals	Percent	Average Terminals
1972	61,500	22,750	37	24
1973	70,100	30,100	43	24
1974	80,600	38,700	48	25
1975	92,700	50,000	54	25
1976	105,700	62,400	59	26
1977	119,400	75,700	63	28
1978	133,700	88,000	66	30
1979	148,400	100,000	68	33
1980	163,800	114,000	70	36

Source: *Frost & Sullivan*

Terminals in Use

	Terminals in Use	Revenue per Terminal	Annual Data Revenue	Data Revenue Growth
1972	545,000	$1,750	$0.9 billion	38%
1973	720,000	1,700	1.2 billion	29
1974	960,000	1,650	1.6 billion	28
1975	1,250,000	1,600	2.0 billion	27
1976	1,620,000	1,550	2.5 billion	25
1977	2,120,000	1,500	3.2 billion	27
1978	2,650,000	1,450	3.8 billion	21
1979	3,300,000	1,400	4.6 billion	20
1980	4,100,000	1,350	5.5 billion	20

Source: *Frost & Sullivan*

Video Terminals in Use

Estimated Video Terminals in Use in the United States

1970	65,000
1971	120,000
1972	180,000
1973	235,000
1974	290,000
1975	325,000

Source: *Communications News*

Facsimile Terminals in Use

Facsimile Transceivers in Use in the United States

1969	9,000
1970	18,000
1971	40,000
1972	52,000
1980	200,000

Source: *Communications News*

Data Modem Sales

Data Modem Sales in the United States

1970	$ 85,000,000
1971	150,000,000
1972	210,000,000
1973	300,000,000
1974	360,000,000
1975	425,000,000

Source: *Communications News*

Bell System Data Sets Installed

Sets attached to both Switched and Leased networks

	LOW SPEED		MEDIUM SPEED	
	Switched	Leased	Switched	Leased
1965	11,400	765	2,300	1,600
1966	17,000	1,680	3,100	2,500
1967	25,000	2,900	4,400	4,100
1968	38,000	5,300	5,600	6,400
1969	55,000	9,700	8,000	9,400
1970	84,000	14,000	14,000	13,600
1971	113,400	18,900	19,600	18,400

Source: *AT&T*

Data Communications Growth Is Dramatic

Entire computer industry now moving into exciting era of communications

If the 1960s was the "decade of the computer," the 1970s will certainly be known as the "decade of communications." And the computer industry itself is already deeply involved in entry into this exciting communications era.

The various tables on these two pages give some measure of the dramatic growth expected in the data communications area during the next few years.

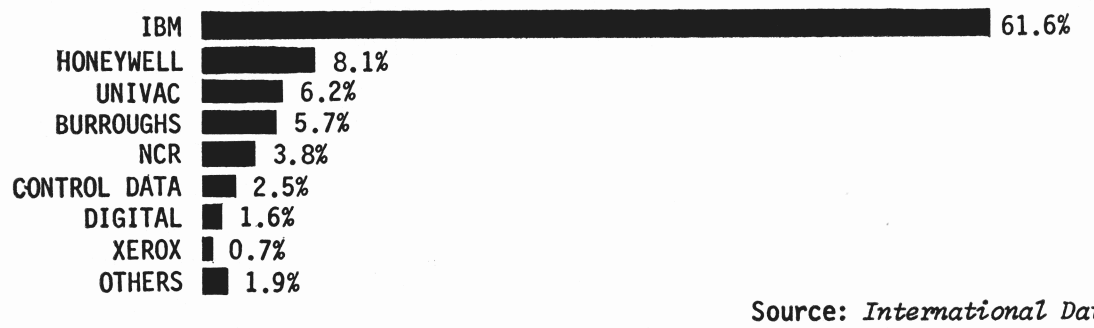
As recently as 1960 there were just 5,400 computers in use. By 1970 the number of general purpose computers in use had jumped to 49,000. And today, as shown at left, there are 61,500 . . . with the total expected to climb to 163,800 by 1980. Reflecting the growth in data communications, it is estimated that only 185,000 remote data terminals were in use in 1970 while today the total is 545,000 . . . with over four million expected to be in use in 1980! Note especially the expected climb in percentage of computers with remote data terminals and in the average number of terminals connected to each computer.

Interesting, too, are the changes taking place in the kinds of terminals used. Back in the 60's as shown below, key punches were *the* entry devices. Now, altho the keypunch still dominates the computer entry area, other devices are gaining in popularity . . . *substitute* devices like key-to-tape units and processor stations . . . and *alternative* devices like Teletypes and CRT units.

Carriage of data, too, is a great growth area . . . with the telephone companies (Bell and Independent), Western Union, and the specialized common carriers (TCI, MCI, Datran and many others) all anxious for a share.

Dramatic, dynamic growth in the communications area ("Shipments of communications equipment will double over the next seven years," says Arthur D. Little!) is at hand . . . and growth in data communications will be the most exciting aspect of this "decade of communications."

Shares of the Computer Market



Source: *International Data Corporation*

Computer Shipments by Product

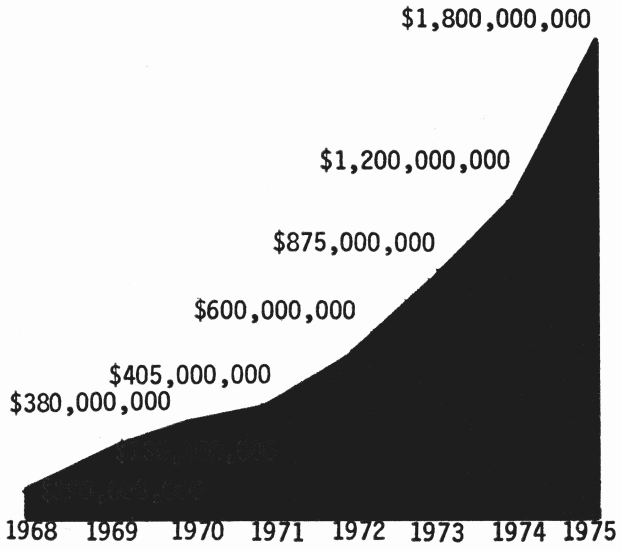
Distribution of USA Computer Shipments by Product

	1966	1969	1972	1975
Central Processors	$1,080,000,000	$1,550,000,000	$1,763,000,000	$2,460,000,000
Main Memory	363,000,000	775,000,000	854,000,000	1,003,000,000
Disk Drives	254,000,000	775,000,000	905,000,000	1,848,000,000
Tape Drives	363,000,000	505,000,000	440,000,000	462,000,000
Terminals	83,000,000	260,000,000	455,000,000	924,000,000
Card Readers, Printers	607,000,000	775,000,000	883,000,000	1,003,000,000
	$2,760,000,000	$4,640,000,000	$5,300,000,000	$7,700,000,000

Source: *International Data Corporation*

Carriage of Data

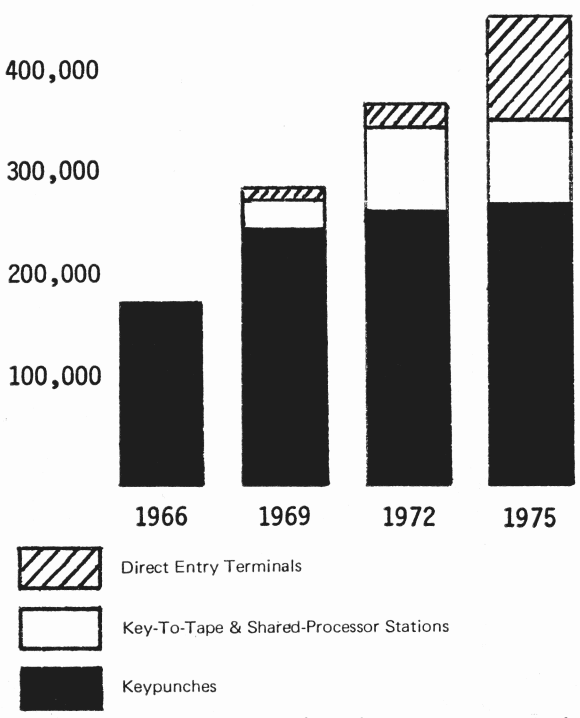
Includes Bell System, Independents and Specialized Common Carriers



Source: *International Data Corporation*

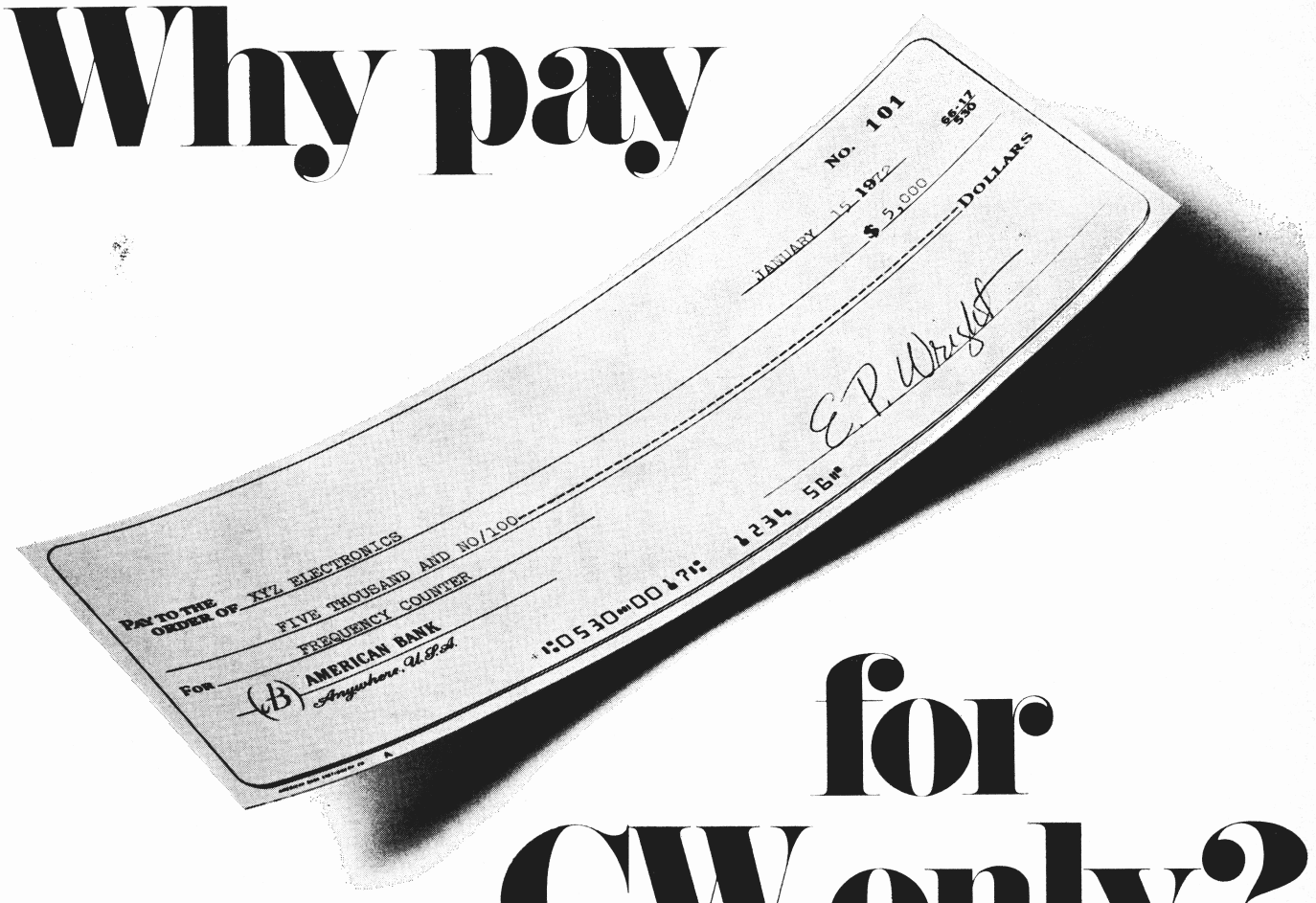
Entry Devices Used

Trends in Type of Entry Keyboard Used with Computers in United States

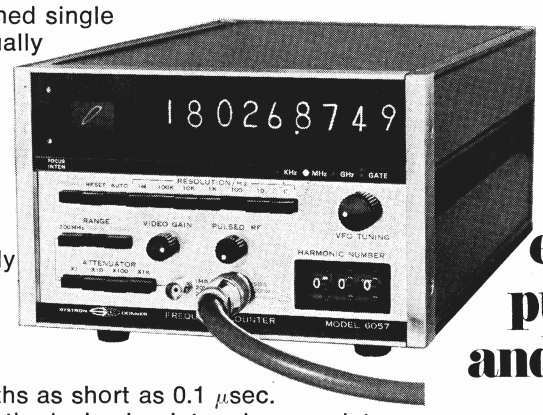


Source: *International Data Corporation*

Why pay for CW only?



You're looking at the only self-contained single instrument capable of measuring virtually any microwave signal from 20 Hz to 18 GHz. It's Systron-Donner's 6057 frequency counter, which combines S-D's Automatic Computing Transfer Oscillator (ACTO®) with an advanced manual T.O. system.



CW and AM measurements are fully automatic from 20 Hz to 18 GHz—simply connect the input and read the final answer. FM and pulse modulated carriers are measured using a simple 3-step operation which yields direct readout answers, even with pulse widths as short as 0.1 μsec.

A full nine digit readout with automatic decimal point and annunciator is standard. Resolution down to 1 Hz is selectable from front panel pushbuttons. Options include digital outputs, remote programming, and a complete selection of extended stability time base oscillators.

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Circle 33 on Reader Service Card

Amoco Scientists Design Plants and Plot Data with Graphic Terminals

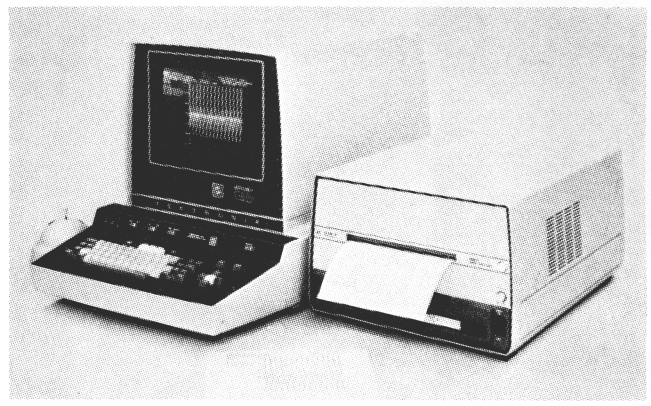
Scientists and engineers with Amoco Production Company are rapidly increasing their use of interactive graphic terminals for computer applications. The Tulsa Research Center of Amoco Production Company, a subsidiary of Standard Oil Company (Indiana), has been responsible for the development of these applications in the company.

One application relates to the large files petroleum companies maintain of data on the wells which have been drilled by all of the oil companies. These files provide one of the basic sources of information analyzed by the exploration people in their search for additional petroleum reserves. Making it possible for the exploration people to access this information and display it, in graphic form, in a short period of time is a very valuable feature of an interactive graphic terminal. The increase in the amount of work that can be accomplished as well as a more effective means of display are important.

Amoco is using Tektronix Interactive Graphic Terminals (4002As with hard-copy unit), small computers, and a communications network to make it possible for people in remote locations to have access to these large data files.

Simulates Gas Processing Plants

Another application involves the simulation of gas processing plants and their evaluation by a computer. This permits a process engineer who is not familiar with computers to make use of a large and complicated set of simulation programs to evaluate various design combinations. It also allows him to observe what might happen as the result of minor modifications in his plant design.



Output from a General Electric time-sharing computer in Los Angeles is received in Tulsa via leased wire on a Tektronix 4002A graphic computer terminal and 4601 hard-copy unit, where it is examined by Amoco engineers who monitor the planned drilling progress and, if necessary, recommend changes in the drilling variables to improve drilling performance.

Programs Boost Efficiency

Amoco has been a leader in the development of computer programs which help to improve the efficiency of well drilling. It is now possible to transmit current well information to central computers, where recommendations are made on the best combination of drilling bits, rotary speeds, rate of mud circulation, mud solids, and other factors which can influence the selected drilling rate. Computer output can be displayed on the terminal screen in graphical form and examined by the engineers who monitor this planned drilling program. If necessary, recommended changes in the drilling variable to improve the drilling performance can then be relayed to the drilling site. There have been very spectacular savings in drilling costs (as much as 30 percent on a well) from the use of these computer programs, and the display and evaluation of the data in a graphical form has played a part in this analysis.

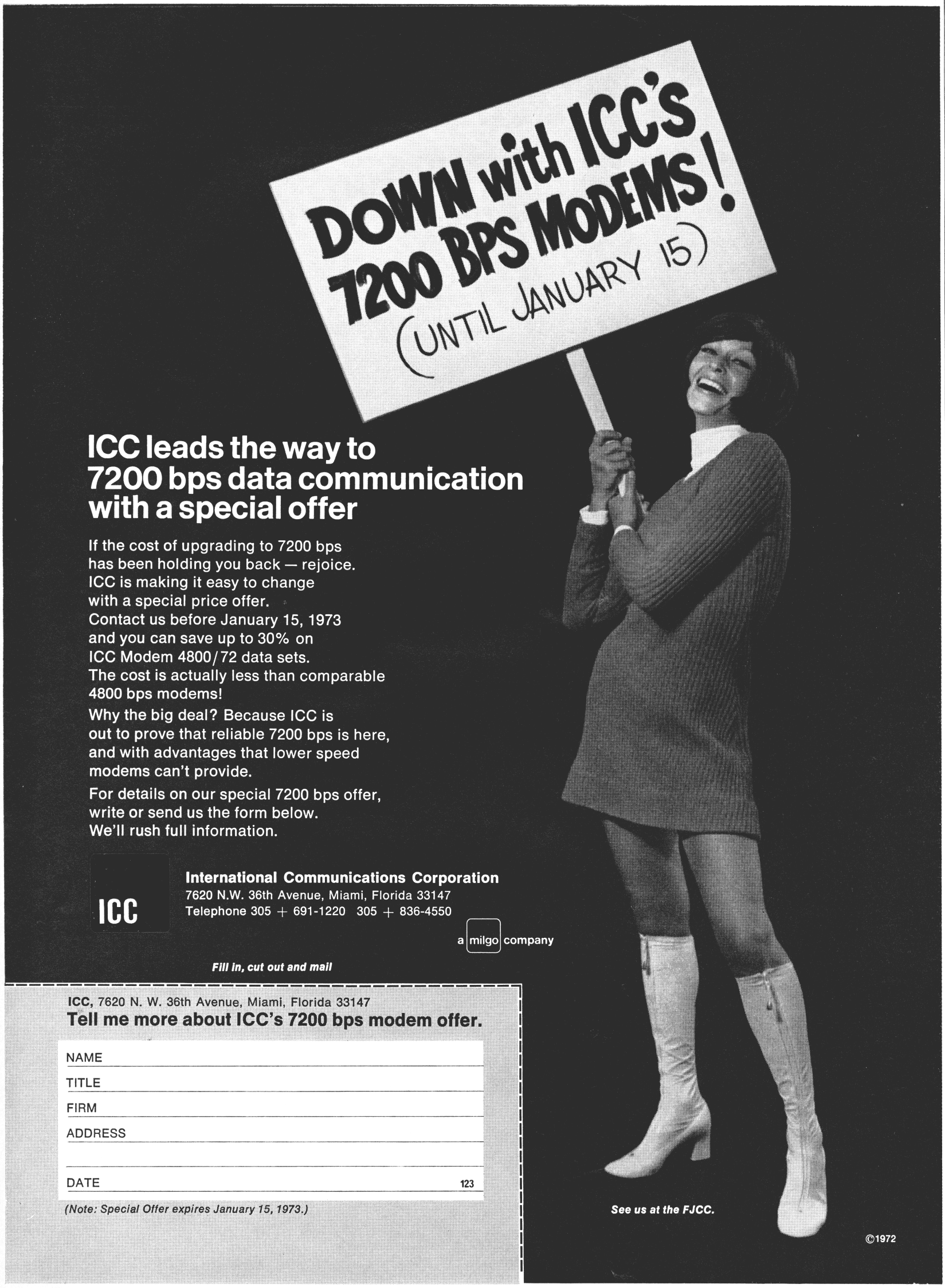
According to Amoco, interactive graphic applications are rapidly being added to the family of computer programs available to the scientist. Such diverse areas as well log analysis, seismic data interpretation, design of offshore drilling platforms, and secondary recovery applications could be greatly improved by the use of an interactive graphic terminal as an input and output device. The ability to portray the output graphically and react to this display is important.

Simplifies Computer Use

The goal is to make it possible for the scientist to use computers more easily without being a computer expert and to give them output in a form more adaptable to their preferred mode of operation, namely graphs and charts, rather than printed numbers on a piece of paper.

It may be difficult to decide which part of the value obtained from the use of these programs should be credited to the system of computer programs and which to the interactive display system, but it is believed that the total improvement in the capability of the scientist is going to be very large and this improvement can be accomplished more easily with the help of interactive graphics.

The use of interactive graphic devices will not be restricted to the scientist. Many of the large data files now developed or being developed are also management oriented—some almost exclusively so. Interactive devices will be used to extract the information stored in these large data files. The desire of Indiana Standard is to make maximum use of the information available. The goal is to have response systems which avoid the need for a manager to be a computer expert and also give these managers information in the forms (pictorially or numerically) which are most meaningful to the problem under consideration.



Maintaining Data Communications Gear

By Frank Geyer

Manager, Customer Engineering
Iomec, Incorporated

Reliability of data communications is dependent on maintenance at all levels. Maintenance in its pure form would retain the data communication system in its existing state. Certainly a poorly designed system would not be desirably retained in its original state. Maintenance commonly is thought of as the customer engineer who provides emergency or preventive maintenance. The customer engineer's mystic skills are limited to the technical maintenance of the hardware. A closer look reveals what is behind the total maintenance concept—system design, environment, operation, and maintanence of all hardware.

System design, as it affects maintenance, necessitates careful attention to some key factors. (1) Compatibility of the systems components; that is, input data to data terminal, data terminal to modem characteristics, modem to line characteristics, and data terminal to processor. (2) Balance of the systems components. The system is as good as the weakest component, starting with the operator through to the processor. A mismatch at any point exerts excessive pressure on other components, resulting in increased failures. (3) Systems specifications should be designed to capture operator and hardware errors. Loose specifications result in excessive operator and customer engineer maintenance. (4) System backup should be provided based on the resulting costs of downtime and the predicted emergency service response time, Mean Time Between Failures (MTBF), and Mean Time Before Repair (MTBR). Lack of backup tends to place an excessive burden on the service company to provide rapid emergency service. Complete hardware maintenance may be inhibited as a result of insufficient backup. Scheduling becomes a major factor when backup is unavailable. Typically, a multipoint data communication system might be scheduled to negate complete hardware maintenance at some locations due to a high percentage of systems-use time during the prime maintenance period in certain time zones. Scheduling which permits complete maintenance will result in fewer emergency service visits.

The environment of the data-communications system is normally beyond the scope of the system designer. The environment in which the data equipment is placed is the most severe, hostile conditions in which we ask any data-processing hardware to operate. The environment is normally loosely specified as a means to enhancing marketability, and the conditions are normally left to the discretion of the user, who in most cases has little or no knowledge of data communications and the stringent requirements. The environment as it affects the data communications hardware is the aggregate of physical location, temperature, humidity, dirt conditions, and power source. Early data-communications terminal designs followed that of computer systems which exist in a controlled environment. The data-terminal design is becoming more ruggedized, and the user more knowledgeable. However, the environment surrounding the data terminal continues to contribute heavily to the maintenance requirements. Environment-caused service requests frequently go unresolved due to the lack of definitive information. The customer engineer is often asked to investigate a data error or halt condition that occurs only under specific conditions. In this respect data communications is quite unique, since the customer engineer is often not repairing, but locating the source of the error condition and eliminating same. It is sometimes confusing to the user when the customer engineer doesn't disassemble the data terminal and replace a part. Instead, he may connect a copper ground to a water pipe to eliminate a static charge, or have the power source changed to eliminate transients which may be causing data errors.

Since many of the maintenance requests result from soft errors (data errors), not hard errors (equipment failures), the user should place more emphasis on the environment in which he places the data equipment.

Operational maintenance is the first level of maintenance after the criteria of system design and environment have been met. The skill level of the data-communications operator must include: the ability to analyze and resolve minor communications problems; provision of operator equipment cleaning and maintenance; and enough dexterity to preclude equipment damage and mishandling of source data.

Training of all operator personnel covering not only the user's operation but fundamental maintenance practices results in a successful system. The operator is the key to the success or failure of a data system. Yet, he or she is often forgotten when analyzing the reasons for a systems failure and/or success. The customer engineer makes periodic corrections for hardware malfunctions and potential failures. He is unable to prevent operational misuse of the data equipment, which results in deterioration of the system's performance.

The maintenance of the hardware is where the buck stops. The data-communications system consists of source data, input device and operator, data terminals and operators, modems, communications circuits, and processor. Commonly, a network may involve four or more hardware suppliers. Defining the origin of a soft or hard error may be a complex and frustrating matter. The data-terminal supplier is normally the focal point for the systems trouble analysis. The user normally directs other than obvious problems to the data terminal customer engineer for solution, since he normally is most knowledgeable on the total system. The result is a higher service-call rate on the data terminals in an effort to effect repairs on the total system.

Maintaining the Hardware

Contract maintenance has found wide acceptance by the hardware users. It may be considered a maintenance insurance policy providing the user with similar advantages. On the plus side, the maintenance contract provides fixed service costs and guaranteed total maintenance for the term of the contract, and, most important, the service company poses the onus to maintain the hardware.

The contract price enables the users to enjoy cost averaging, avoiding the exorbitant charge for servicing a high-failure unit. Budgeting for fluctuating time and material service charges is virtually impossible, resulting in a harassed feeling by the user. The guarantee that parts, technical skill, and support will be available as the users' hardware ages is a key factor in planning the hardware's term of usefulness.

The burden of maintenance responsibility placed on the service company results in a concerted effort to improve the hardware reliability. The service company scrutinizes price analysis reports for MTBF trends on the hardware down to its components. Concurrently, the service agency searches for components which will have greater longevity, and for engineering improvements to extend the MTBF, and continuously strives to improve the technical skill and test equipment of the customer engineer. The service company's margin of profit is based on reducing the amount of service required; thus, the effort results in improved MTBF for the user. Why, then, do some users prefer time and material maintenance? They normally do not mind the erratic service charges and make an effort to keep service requests to a minimum. Certainly, a key factor for the time and material customer is the workload and dependence on the hardware.

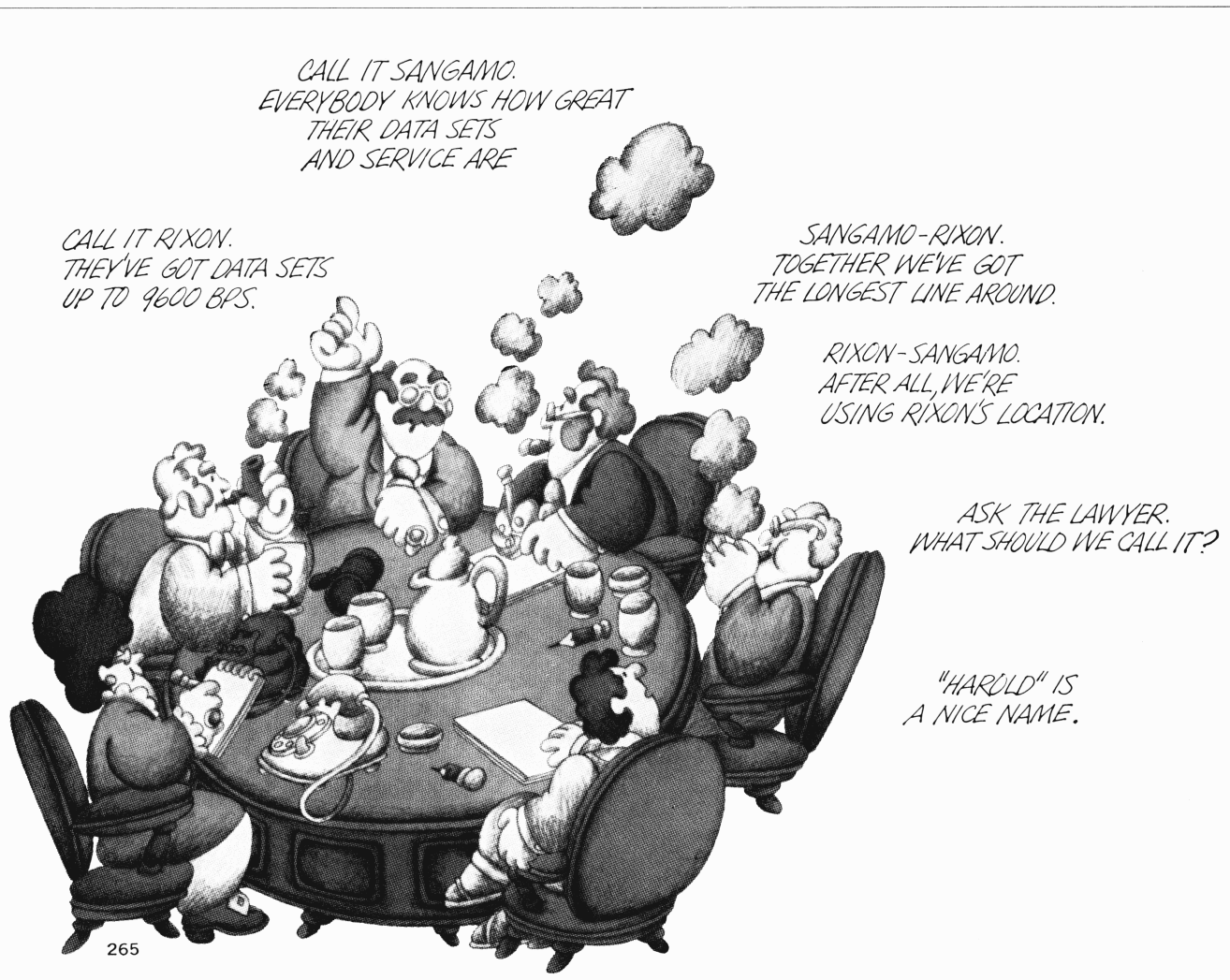
Maintenance Evaluation

How do you measure the quality of maintenance? In the case of data communications, it is imperative that we sift out the nonmaintenance problems. Then there is the determination of hardware design weakness versus maintenance quality.

Hardware maintenance quality may only be judged over a long period and is relative to the amount of equipment used. The user rarely has enough information to judge the value of his maintenance contract. The user may even feel cheated if the service company is successful in improving the MTBF—thinking he is not receiving enough service for the price of the contract. The user has no knowledge of the behind the scenes efforts of the customer engineer to extend the MTBF.

Possibly the simplest evaluation of maintenance is a view of the end result.

In summary, the total maintenance concept includes system design, environment, operation, and the hardware. The systems success or failure is predicted on the performance of these delicate factors. Added insurance may be achieved by a maintenance contract, which may be part of a rental agreement or a separate agreement. The sum total may then be the result of the maintenance evaluation —equipment availability to the user.



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Eases credit-reporting chores!

TRW Credit Data Implements National Credit Reporting System

A sophisticated national credit reporting system which can recall and display detailed information in from four to 10 seconds on personal credit experiences for any one of upwards of 30 million people has been implemented by TRW Credit Data of Anaheim, California, a subsidiary of the giant aerospace and technology corporation and one of the largest computerized credit-reporting operations in the United States.

The information display system utilized by Credit Data is the Datapoint 3360 from Computer Terminal Corporation. The Datapoint 3360 units are, in fact, the key to the swift, cost-effective service provided by TRW Credit Data to its many subscribers. Approximately 350 of these units are installed at the company's six regional operations centers in Anaheim (for Southern California), San Francisco, Chicago, Detroit, Buffalo (for upper New York State), and Fairfield, New Jersey (the New York City metropolitan area). There is also a franchised operation in Phoenix, Arizona. They constitute the on-line links to TRW's computerized credit files and can, under normal circumstances, display information on individuals within four to 10 seconds after receipt of identifying data.

TRW Credit Data is one of the oldest credit-reporting agencies in the United States, having begun operations in Detroit in 1930. It is also the oldest computerized credit reporting operation with its start in this area going back to the early 1960s. In 1965 the company opened the nation's first fully automated credit information service. Credit Data became affiliated with TRW in 1969 when it realized the potential use for advanced communications technology in this field of growing importance.

30 Million "Experiences"

All data files for TRW Credit Data are maintained in a large computer center near the company's headquarters in Anaheim, California. The center houses two IBM System/370 Model 155 computers and seven IBM 3330 disk files which combined afford about 4.8 billion 8-bit bytes of storage. These files contain credit data, basically "experience", on about 30 million persons. This "experience" data is derived primarily from TRW Credit Data's 6,000 subscribing companies. These are mainly commercial enterprises such as banks, retailers, credit-card firms, oil companies, small loan and sales finance companies, and other lending institutions.

Information from these files is made available to subscribers in several ways. Most high-volume users of the credit-reporting service have teleprinter units installed in their facilities which provide a direct link to the disk files. Overall, some 450 units tie into the computer center, on a dial-up basis usually. Other subscribers use TRW's written reports which can be requested by mail or telephone. The requests are processed daily and are ready for pick-up or mailing to the subscriber's office the next morning.

Approximately half of the inquiries that come into TRW centers are received via phone service and handled by girls sitting in front of Datapoint 3360 units.

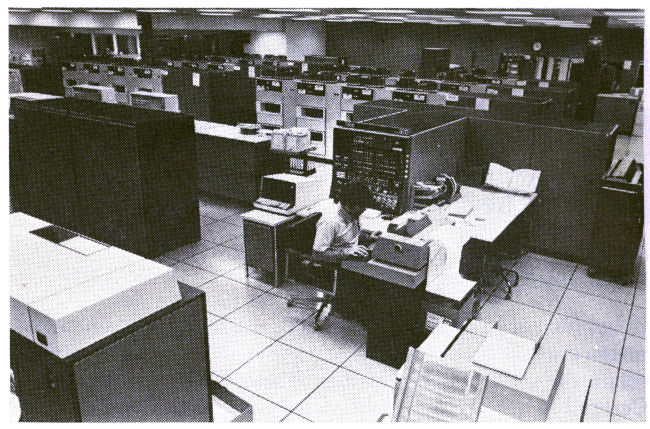
Handling the Phone Inquiry

A primary point of customer contact for TRW is the telephone inquiry coming in over toll-free lines, often with the individual being reported on standing near the inquirer. It is imperative that these requests be handled expeditiously and accurately. The ample screen area of the Datapoint 3360s (25 x 70) can accommodate some 1,972 alphanumeric characters, about double that of most display systems. This allows full display of the credit report format with easy visibility accorded to the credit-file operator.

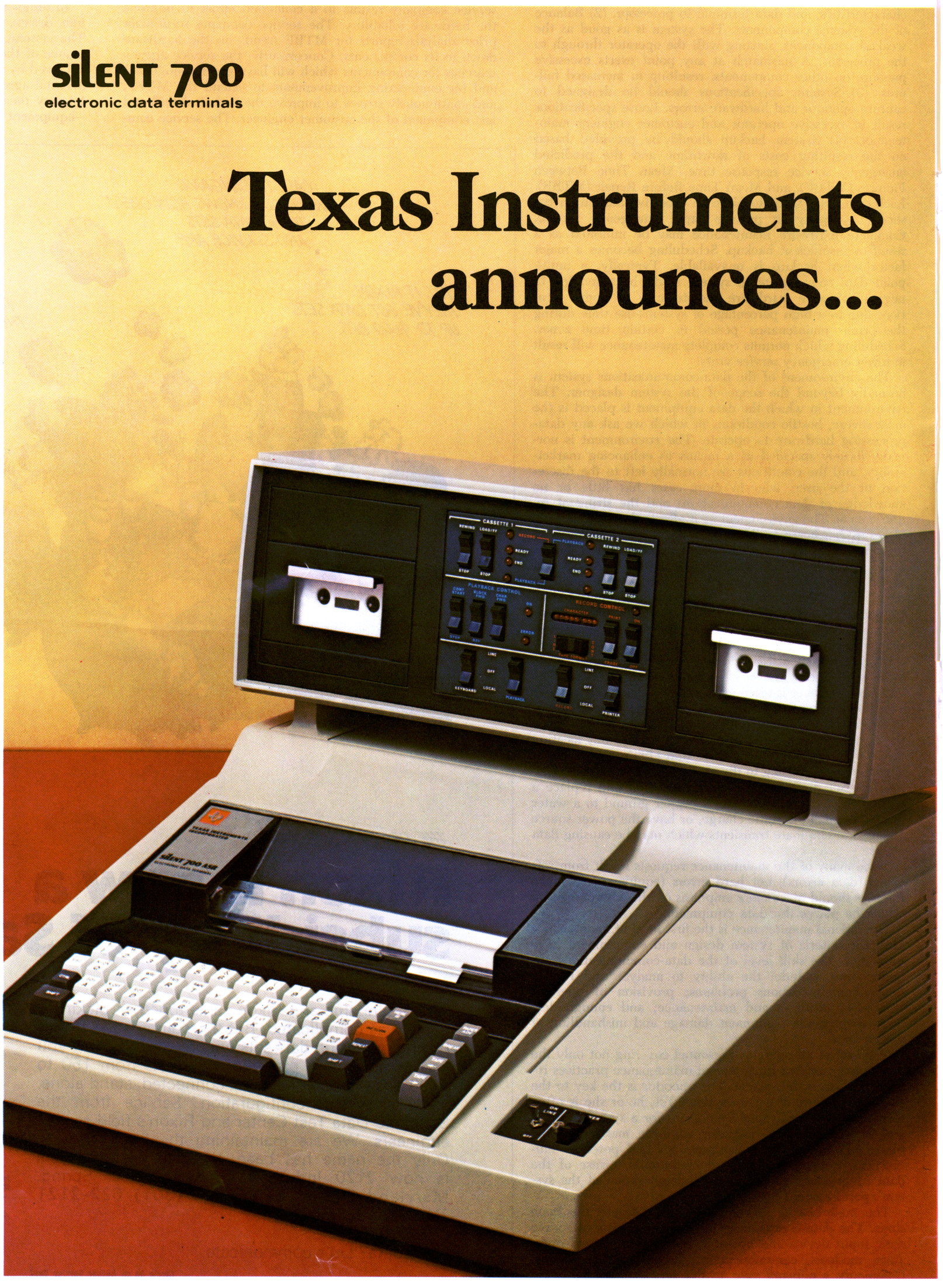
The Anaheim Operations Center presents an attractive composite of computerized efficiency and feminine vivacity and alertness. At peak work periods, there are over 100 girls seated at rows of Datapoint 3360s. The large automatic call distributor on the wall, with its blinking red, yellow, and green lights, dominates the scene and provides the knowledgeable observer with useful information on the flow of work being handled. TRW's peak days are Mondays and Tuesdays and peak hours occur from mid to late morning. Employees are scheduled accordingly to maintain a high-level service to subscribers.

Taut Phone Protocol

The phone protocol at TRW is taut and efficient. Girls request certain basic information from the subscriber phoning in on the individual who has applied for credit. This includes

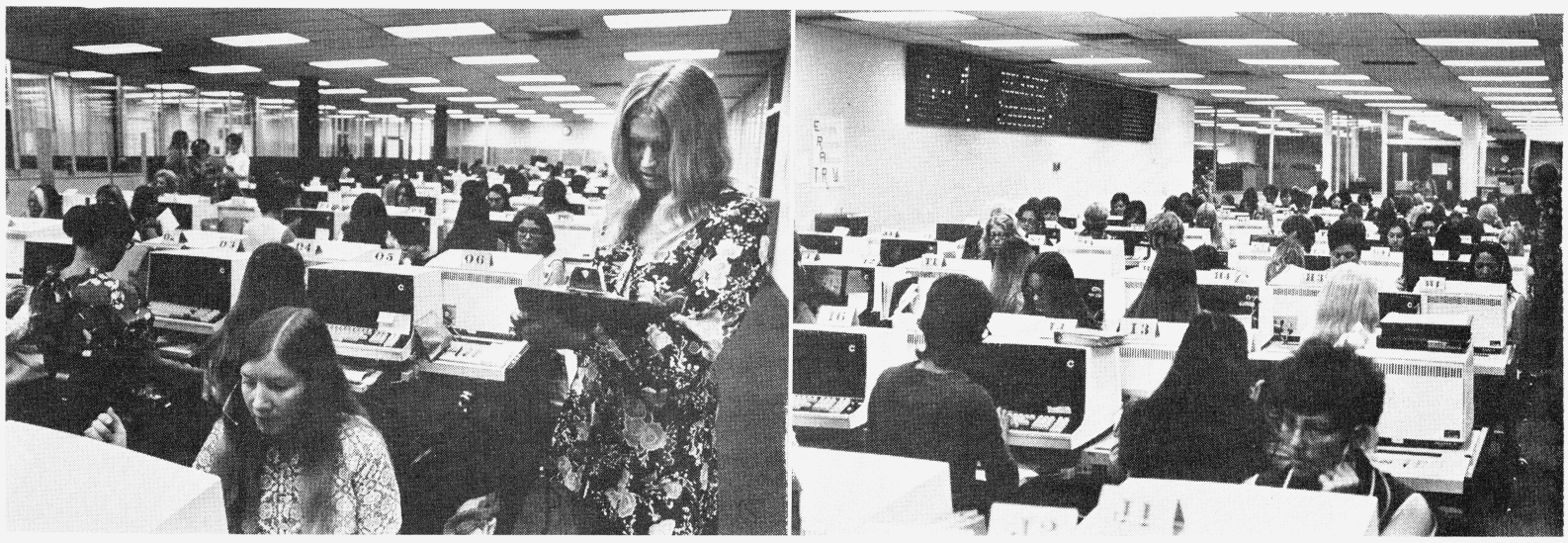


A view of the TRW Credit Data Computing Center in Anaheim, California, where over 30 million individual credit "experiences" are stored. The center houses two IBM System/370 Model 155 computers and seven IBM 3330 disk files which combined afford about 4.8 billion 8-bit bytes of storage. The "experience" data is derived primarily from TRW Credit Data's 6,000 subscribing companies.



name, address, social-security number, and other basic information which she keys into the Datapoint unit. The format of the credit report is displayed on the screen and can give a visual check to the data even as she keys it in. When access identifier requirements have been satisfied, the girl makes the request of the computer operation for a report on the credit experience of the individual. Typical response time for this sort of query is four to 10 seconds. From the information displayed, the girl reads the relevant data off to the inquirer. If a lengthy credit record is involved, it will come in several displays which the girl relays to the phone inquirer. As stated earlier, TRW operators report credit experience, not interpretation of a person's credit record.

A critical aspect of the TRW operation relates to the security and privacy of the credit information assembled on individuals and guarding against misinterpretation of the information. Great care is taken to make sure that any experience that might be considered negative is accurately and reasonably reported. Anyone who disagrees with a credit report issued by TRW is encouraged to come to their offices, look at the report, and identify areas of dispute. After investigation if an item is found to be inaccurate or if it cannot be verified, it is promptly deleted.



Phone protocol at TRW Credit Data is taut. Typically it takes from four to 10 seconds to respond to a subscriber's request for information. The girls read the credit data directly off the Datapoint 3360 screen. A mammoth overhead call director provides visual indication of the flow of subscriber calls into TRW Credit Data.

In addition to the individual name, street address, and social-security number, other basic identifiers are used to make sure that the person being reported on is the same as the person being inquired about. Various security checks are maintained to insure the individual's privacy.

Sophisticated Linkages

TRW Credit Data facilities are tied to the computer operation in Anaheim by a complex and sophisticated network of dedicated voice and data communication lines. High-speed (4800 baud) data lines exist between the principal facilities in the East and Anaheim as well as between San Francisco and the Southern California site. A major changeover is occurring, however, in the East Coast linkage where Telpak C service is being inaugurated by stages between Anaheim and a new TRW facility in Fairfield, New Jersey. In due course all phone and TTY inquiries arising out of the Northeast will be directed via dedicated lines into Fairfield and then sent out West via Telpak service. The eventual savings and the increased volume of traffic promise to be substantial.

Fanning out from local TRW centers are a variety of leased voice and data lines. For the Anaheim regional operation, for instance, there are over 100 voice or teleprinter lines that link directly into the phone inquiry department and/or the computer center. This proliferation of lines is necessary to handle the heavy concentration of calls that come into TRW.

Whereas with some systems, a controller is required for each of the 16 display units, the Datapoint 3360s have a much more favorable ratio. As many as 64 systems can be handled by one controller unit, a capability that translates directly into major dollar and cents savings for a large user such as TRW Credit Data. At the Anaheim facility, five controller systems act as "front enders" for approximately 120 3360 units, an average of 24 units per controller, which also acts as "front end" for the teleprinter units tied into the system.

TRW Credit Data prides itself in providing the swiftest and most accurate credit reporting service available at highly competitive rates. The company's knowledge of data-processing and communications technology plus intimate familiarity with all types of credit problems enabled TRW Credit Data to devise new ways of acquiring and transmitting credit information well ahead of the field.

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Data transmission rates up to 120 characters-per-second can significantly reduce line charges. And quiet, 30 characters-per-second electronic printing makes the *Silent 700* acceptable to any office environment. Field operating experience has proven that *Silent 700* terminals typically require only one or two remedial service calls per year.

Communications Economy

Off-line data preparation and transmission from cassette storage reduces errors, line costs and operator time. Simultaneous transmit/receive and simultaneous on-line/off-line operation permit maximum system utilization.

Powerful Data Editing

Data is recorded in ANSI standard block format. Block or character data editing capability is combined with high-speed tape duplicating and an optional automatic record locator for fast search of cassette files.

Reliable Data Storage

Philips-type digital-grade cassettes store 800 bits-per-inch for up to 310,000 characters storage per two-track cassette. Bit-error rates are typically no more than one in 10^7.

Modular Expandability

Simplified design permits easy addition of other optional features including automatic remote control of record-playback functions, answerback memory, and built-in modems. The compact $1500 KSR (keyboard send-receive) model is easily converted to the standard $2750 ASR model by addition of the cassette module.

OEM and quantity discounts are available. Contact the nearest TI office listed below for more information on how *Silent 700* terminals can cost-effectively improve your data communications system performance. Or contact Texas Instruments Incorporated, Digital Systems Division, P.O. Box 1444, Houston, Texas 77001, phone (713) 494-5115, ext. 2126.

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Circle 35 on Reader Service Card

Minisystems Solve Direct Data Entry Communications Problems

By James P. Starks

Honeywell Information Systems

An ever-increasing number of businesses are discovering the advantages of direct data entry for order entry, inventory control, credit verification, and other forms of information entry and retrieval. They have discovered that it is fast and economical, eliminating the need for conversion to punched cards or other media. However, all of this has not been without difficulty. Large numbers of terminals and lines require the information processor to handle line protocols, translate code, and block messages in addition to processing the data contained in the message. Further, the addition of new types of terminals can be a trauma to the entire data-processing operation. A viable solution to these problems is the use of a "Minisystem" for communications control, in this case a remote message concentrator (RMC).

This Honeywell Minisystem is the 73050 remote message concentrator which consists of a 716 processor, line controllers, and operator console.

A remote concentrator is composed of a processor, memory, multiline controller, and 1-4 single line controllers (see Figure 1). In addition, it may have a fixed-head disk for secondary storage. Since communications processing is primarily input/output (I/O) activities, the processor must have significant interrupt handling capability, and, for concentrators of line counts above 32, direct memory access (DMA) I/O is almost essential. Since these charateristics are typical of minicomputers, they are a natural choice in such applications.

The multiline controller can handle as many as 128 inbound (terminal) lines of various speeds. It can even change the line speed and other parameters under software control. For RMC applications, character-forming controllers with DMA I/O transfers are preferable. The old "bit-banger" type of controller consumes too much processor time at high line counts and faster asynchronous speeds.

As many as four single line controllers handle outbound (host) traffic. They are typically synchronous and in the 2000-10,800-bits/second range, although higher speeds can be used. It is helpful if the single line controller has hardware to detect special character sequences and performs longitudinal parity checks associated with whatever line discipline is used.

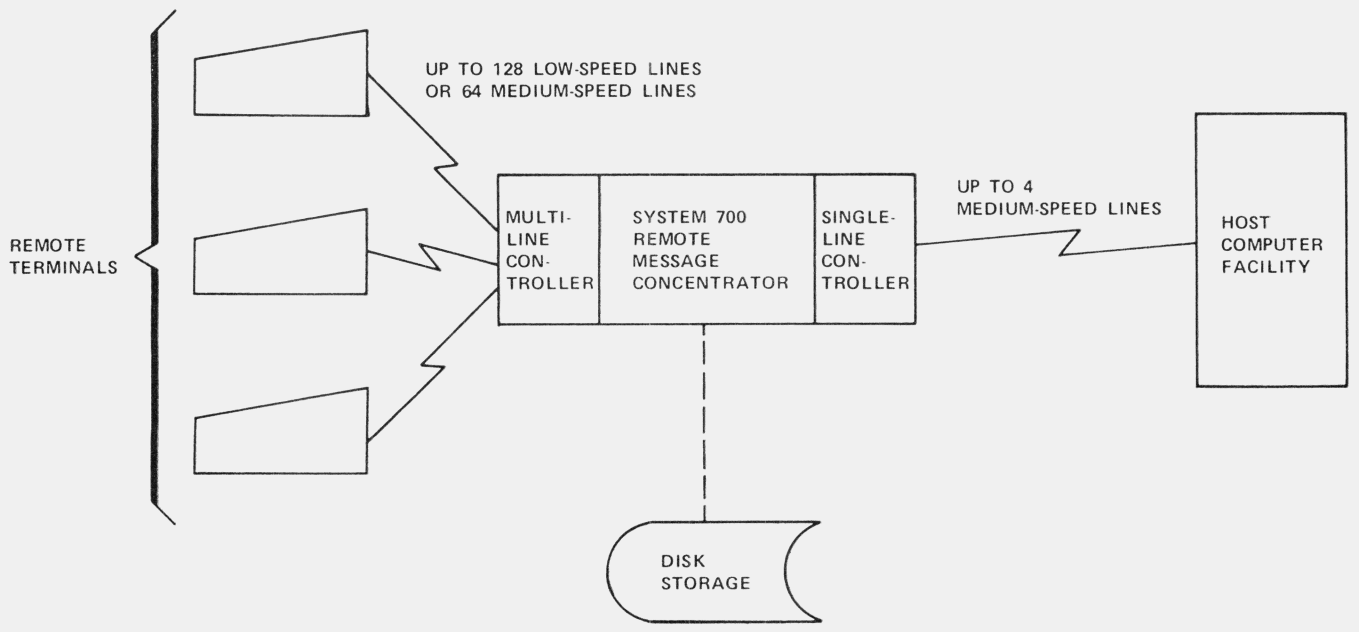

Figure 1. Honeywell System 700 for remote message concentration.

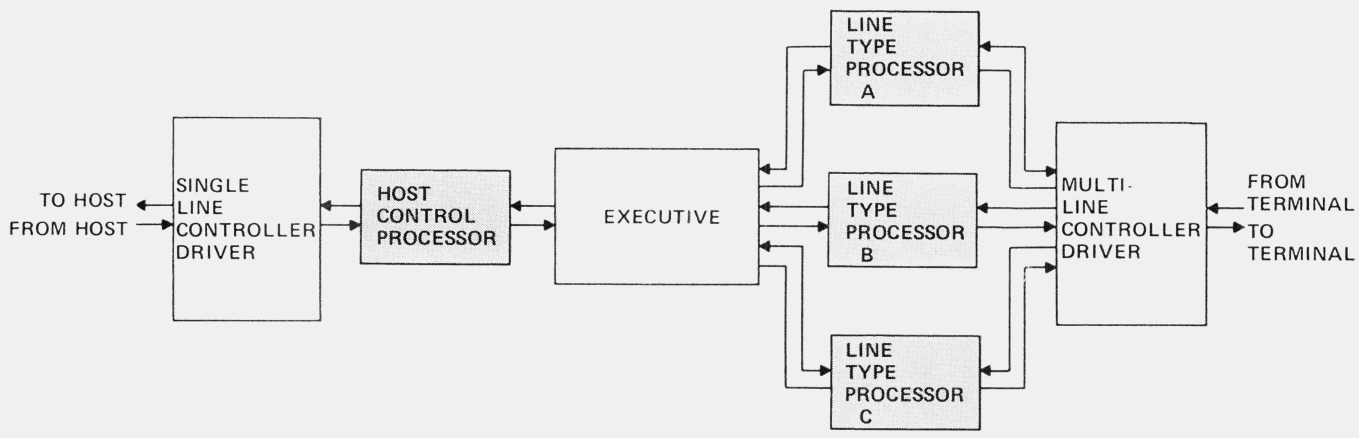

Figure 2. RMC software system. Shaded areas indicate modules which accommodate user-specific requirements.

Since RMCs are primarily used in unattended sites, it is almost essential to have down line loading, protected in a read-only memory. This allows the system to be loaded from the host on power failure or for system update.

RMC Software System

The difference between a collection of hardware and a Minisystem is the system's software. The software for an RMC consists of controller drivers, terminal-specific software, host-specific software, and an executive (Figure 2). The controller drivers simply provide the software interface to the controllers themselves. The executive provides the normal control required in all real-time systems. The key to the system for most users is the library of terminal-specific software. These modules, called terminal control processors (TCP), interface with commonly used single and multidrop terminal line disciplines.

A word should be added about buffering. With the high line counts typical to an RMC, dedicated buffers are unacceptable because they restrict messages to fixed lengths and result in a need for very large memories. The most effective solution is to use a pool of small blocks which are chained together as needed to buffer a message. Such a buffering scheme is essential to an effective RMC.

RMC Functions

Together the hardware and software handle terminal lines via TCPs and buffer and block incoming messages. When the message is complete it is transmitted to the host. Messages from the host are routed to the appropriate terminal line and queued, if necessary, for transmission. System performance is gracefully degraded during sustained peak loads so as to avoid "crashes" of the entire system. Line error rates are monitored and excessive line errors reported to the host.

Through these functions the RMC offloads from the host the tasks of terminal line control, code conversion, and message blocking. Further, the addition of a terminal no longer impacts the host system. In fact, the entire host system can be replaced without impact to the terminal network.

Financial Considerations

In addition to other advantages, RMCs provide significant reductions in line costs. Using system costs for the Honeywell System 700 Model 73050 versus full-duplex lines:

If the mean terminal-host distance exceeds:	RMC saves line costs after:
25 miles	20 lines
50 miles	10 lines
75 miles	7 lines
100 miles	6 lines
150 miles	5 lines
200 miles	4 lines

The Minisystem concept can be applied to other communications situations including, but not limited to, message switching, store-and-forward processing, network control, front-end processing, and remote job entry.

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Circle 37 on Reader Service Card

Buffered Terminals . . . More Bits for the Buck

By Charles M. Gray
Vice President
Pulse Communications, Incorporated

"More Bits For The Buck"—For years this has been a common goal in the EDP industry. Results have been dramatic—increased data speeds, cheaper mass storage, faster modems, greater computing capacity—these are just a few examples. Data input technology, however, has not kept pace with the rest of the industry. This has been especially true of achieving low-cost batch entry from many low/medium-volume entry points to a central computer. The problem is now being solved by a new generation of buffered terminals—terminals that utilize the workhorse of the industry, the Teletype Model 33 teleprinter, and new low-cost solid-state memories.

Solid-state memories continue to drop in cost, and they have arrived on the scene as a very viable way to make larger buffered terminals. These new terminals offer distinct advantages over those having other storage media, especially paper or magnetic tape. More importantly, they offer expanded data entry and communications on existing networks at a low cost—thus, "More Bits For The Buck."

Before examining the features of these new systems, let's consider the terminal itself. What is a buffered terminal? Simply stated, a buffered terminal is a data I/O device with a memory. The memory serves three important functions: it interfaces between a low-speed device and higher speed line; it permits data editing; and it makes the operator's job much simpler. The memory media may be paper tape, magnetic tape, disk, or the new low-cost solid-state storage devices. The terminal may be a teleprinter, CRT, or other device usually with keyboard input. The most common terminal in use today is the Teletype Model 33. Combining these existing terminals with solid-state memory offers a very low-cost approach to a buffered terminal system with high reliability, ease of operator retraining, and retention of hard copy.

Low-Cost Expansion

What can the buffered terminal do for today's system? It can cut the cost of data preparation and permit low-cost expansion utilizing existing facilities. Consider these factors: The buffer interfaces between a low-speed machine of 110 b/s and a communications circuit of 1200 b/s. Data communication speed is increased by a factor of 10. For low-volume users, the time of dial-up calls is reduced by a factor of 10, resulting in reduced telephone charges. For high-volume WATS users, the buffered terminal reduces the number of WATS lines. Many more low-volume remote job entry terminals can be on one line with access to a single CPU port. The computer can poll the many remote terminals. Data integrity can be protected by transmission in blocks from the buffer, application of block checking techniques, and reverse channel signaling.

In addition to low cost, the solid-state buffer has many advantages over the conventional paper or magnetic tape. Of prime importance is the elimination of all moving parts for increased reliability and reduced maintenance. Solid-state memories have no motors, no drives, no heads to be cleaned, and no oxide to wear out, and data bits are never "lost" due to failure to record. Solid-state memories may be modular. Today you pay only for the memory capacity you need, and tomorrow you can increase capacity with add-on modules.

When teamed with the teleprinter, the solid-state buffer permits editing and retention of hard copy. It is fast and simple to "slew" the memory, positioning to a given point such as the beginning of a line or message. New data may be entered, the memory instantly backed up, and an edited hard copy printed.

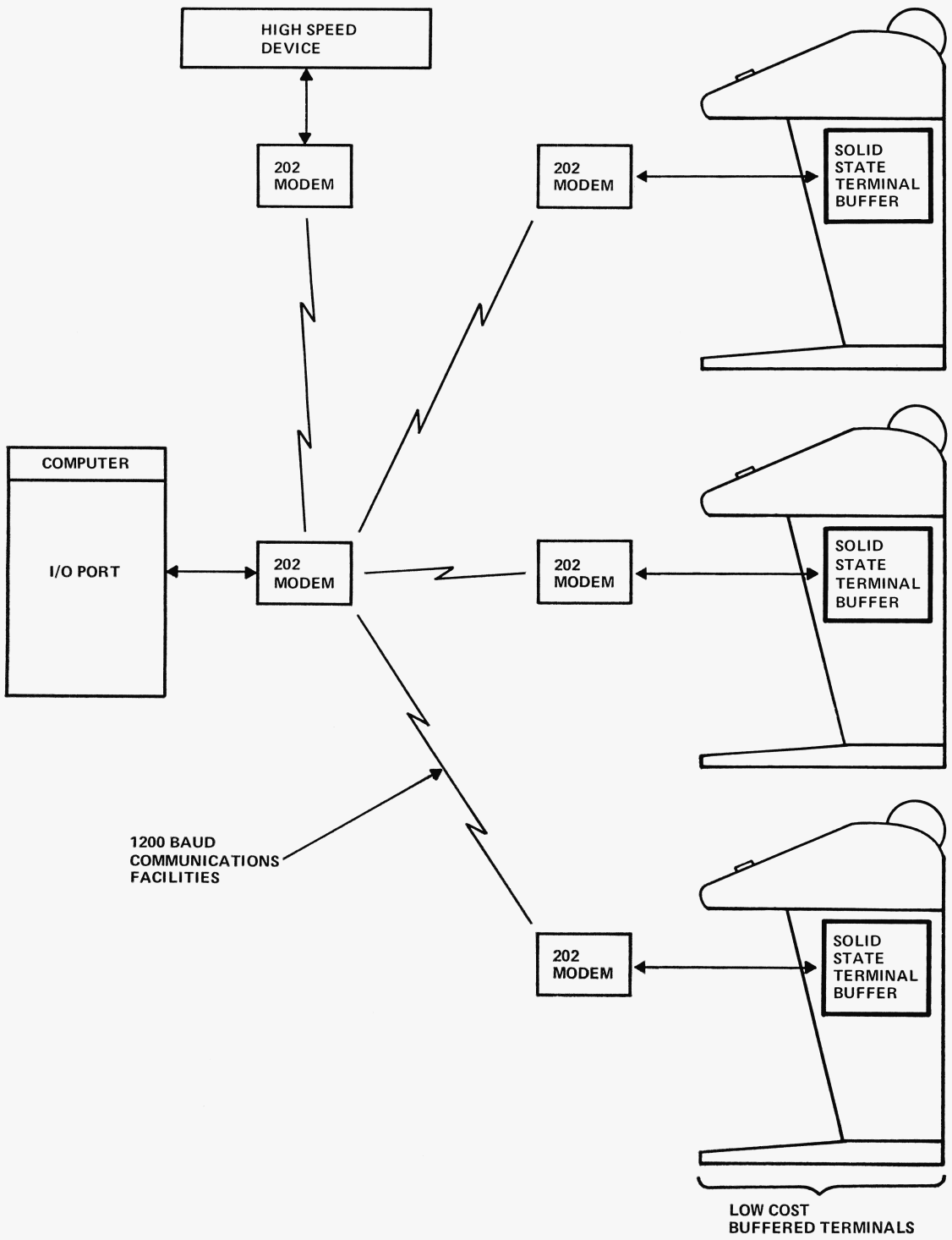
Like all new things, the solid-state buffered terminal is not a panacea for all data entry and transmission systems. There are some disadvantages, especially for larger systems. For example, data in memory is "erased" when new data is entered; thus, the original is lost and not available for retransmission. Of more importance, however, is the limitation of storage size; when memory is full, data must be "dumped" or transmitted. Solid-state buffers are not suitable when an entire day's entry by an operator must be stored for batch entry once each night. A full business day (8 hours) of data entry creates more than 85,000 characters. Cassette or disk memory systems are the answer in this application. There is no problem, however, if data can be dumped once each hour, or if volume is low so a day's intermittent entry will fit into memory.

Ideal Storage Size

What is the ideal storage size for a solid-state terminal buffer? Generally, between 2,000 and 16,000 characters, or 1 to 8 pages of data. This capacity is sufficient for most communications and small batch-entry systems. For larger applications, tape, cassette, or disk storage may be more economical.

When selecting a terminal buffer for a batch-entry system, it is important that the buffer, together with the computer, make a "dumb" terminal act like a "smart" terminal. This permits the standard teleprinter input system to be more flexible like the more expensive devices. For example, consider remote formatting on a teleprinter instead of a more expensive CRT. Operation can be as follows: (1) Format identification is sent from the remote terminal to the computer. (2) The processor sends the desired format to the buffered terminal solid state storage. The processor and communications line are now free for other activities. (3) The remote operator generates a formatted message by following instructions printed out from storage. Data is entered in correct sequence, and editing is performed as necessary. (4) When complete, the message is transmitted to the processor in correct format. The remote operator retains a hard copy of the complete, formatted message.

The diagram shows a typical data system using buffered terminals. Low cost is achieved by using solid-state buffers within existing teleprinters. System capacity has been increased by increasing data rate on existing circuits. System flexibility is increased by allowing direct connection (without buffers) of higher speed devices for high-volume remote users. Cost of the solid-state buffers is low enough that typical leases with teleprinter can be arranged for less than $100 per month —"More Bits For The Buck."



Typical batch-entry system using low-cost buffered terminals.

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Circle 38 on Reader Service Card

Automatic Testing of Data Networks

By George Kushin
Data Products Corporation
Stelma Telecommunications

Large corporations and institutions have spent millions on sophisticated computer and peripheral equipment to speed order-entry traffic, shipping, sales reports, inventory control, and so forth. Yet often they don't lavish the same attention on the system's communications network. Then they discover communications problems are a major cause of down time.

Locating communications faults and getting them fixed can be a real headache. Suppliers maintain service responsibility for their equipment, but the real problem in a communications network is identifying which piece of gear to maintain. When one piece goes out, the link is lost. Is the fault in the line, the modem, or the terminal—or perhaps the computer or its program?

With today's buying patterns, each piece of equipment frequently comes from a different supplier—and that usually means several maintenance organizations share responsibility for the system. But communications managers are discovering that in real life instead of sharing, servicemen often yield to the human temptation to pass the buck, which can hang up repairs a long time.

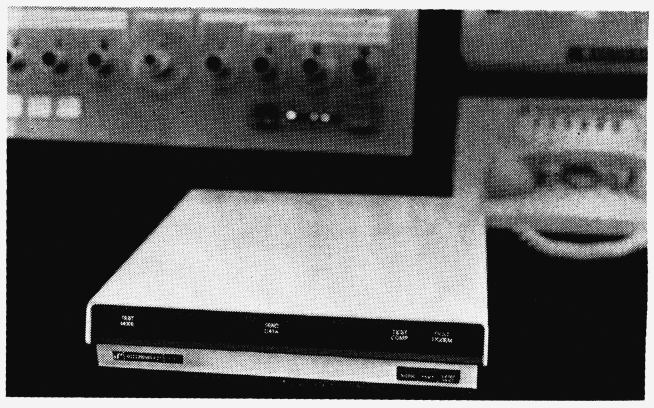
In the final analysis, responsibility lies with the communications manager. This calls for some inexpensive method of monitoring the system and diagnosing problems on the spot. In this way, the right maintenance organization can get the line back in operation quickly. The problem of monitoring a data-communications system is difficult because the communications lines between a company's central office and its remote data stations are forbidden territory; the common carrier does not permit customers to touch these lines. Diagnostic procedures must be carried out on the customer's side of the system.

Several types of test equipment are on the market to do the job, but until now, they always required a skilled technician to analyze and interpret results. Although skilled technicians can be found at most computer sites, it isn't economical to place such personnel at remote bank offices, sales offices, and warehouses.

Some information can be obtained without use of external test equipment. Many modems incorporate diagnostic features to check out some network elements with loop-back tests. Again, these tests require skilled technicians and are not always possible anyway. Even if loop-back tests are possible, complete diagnosis is not always achieved. For an accurate diagnosis, a complete end-to-end test is required.

New equipment has been developed that can solve this problem for the communications user. The data-transmission test system uses test methods established for existing modem test equipment, but carries out all tests automatically, analyzes tests results with its own logic, and displays the results—pinpointing the fault to the specific network element and frequently identifying the nature of the problem.

For the first time, communications managers can positively identify a defective network element without calling a technician. A secretary, bank teller, or airlines reservation clerk can do the job. All that is required is pushing a button and reading the display—then calling the proper service organization.



The DETECT diagnostic system, designed and produced by Data Products, Stelma Telecommunications Division, analyzes the operation of an on-line communications channel by exercising the various channel elements in a preprogrammed sequence, keyed to the associated modem type.

Testing is performed over the entire data communications link, including all communications elements and the data sets, at both the central (CPU) location and remote terminal locations. The analysis is not limited to apparent indications at the CPU site. It's based on the performance of the entire line.

The test system lets the communications manager monitor his data network on a regular basis because the units are in the network, located between the computer and the modem at one end and between the modem and the terminal at the remote-data-station locations. The units pass signals without interference until the test cycle is activated. When a problem is encountered—perhaps a terminal stops printing data or the CPU indicates a terminal is not responding—the terminal and CPU operators contact each other by phone. They depress the "Test" button on their units, and the test sequence, which takes about two minutes, proceeds automatically. In the test cycle, the system disconnects the data terminal, and, with the CPU, forms the network and, in effect, acts as the data terminal and the computer.

The system operates with dial-up networks or dedicated networks and with any modem having EIA interface—synchronous or asynchronous, two wire or four wire—by varying the control program.

This system exercises the various channel elements in a preprogrammed sequence and analyzes the response of the interchange circuitry. The faulty network element is identified by a process of deduction—much as a skilled technician analyzes results, except the deductive process is automatic.

Actually, the process is simpler than it appears on the surface. For example, if a single terminal in a dial-up network or a polling system is not operating, then the CPU, central modem, and trunk line can be assumed to be functioning properly. After all, they work with the other terminals in the network. This leaves only the communications leg to the remote terminal, the remote modem, and the terminal itself to worry about. So only the remote modem and data line need actually be tested. If they function properly, then the trouble is clearly in the terminal. Furthermore, terminals are impractical to test on a regular monitoring basis, because they are complicated and vary widely in type. In most cases, a thorough test of the data link—modem-to-modem—is all that is required to accurately pinpoint the problem area.

The automatic data-transmission test system tests a dial-up network quickly and easily. The first step is to notify the operator at the remote location to simply push the test button of the test unit. Then a data call is placed to that location from the central location. The test system checks initial state of the EIA interchange circuits at central and remote locations. Then the unit at the remote location automatically answers the call when the ring signal is received, performs still further checks of the modem hand shaking, and then transmits data from the remote to the central. Simultaneously, the remote test unit checks to insure that it's sending good data while the central test unit checks the quality of the data being received. If this portion of the test is completed successfully, the call will be turned around, and the central test unit will then transmit to the remote and once again analyze the quality of the data transmission.

Upon completion of test sequence, both units indicate the test is complete, proving that both modems in the line successfully established a data call and sent and received good quality data; therefore, the problem must lie either in the terminal equipment or the CPU. If the CPU in the dial-up situation is operating properly with other remote terminals, it is doubtful that the problem could be there. The only place remaining is the one remote terminal.

Had the test sequence been completed, a modem or a line fault indication would have been displayed, depending on where in the sequence the test failed, based on the internal logic of the test system.

The entire test sequence takes only about two minutes. Upon completion, it allows the user to notify the responsibile maintenance organization, which portion of the data communications circuit is faulty. The operation of this type of test system requires no technical knowledge of the communications link. It provides the user with the capability to pinpoint the fault, and insures that it will be repaired in the shortest possible time.

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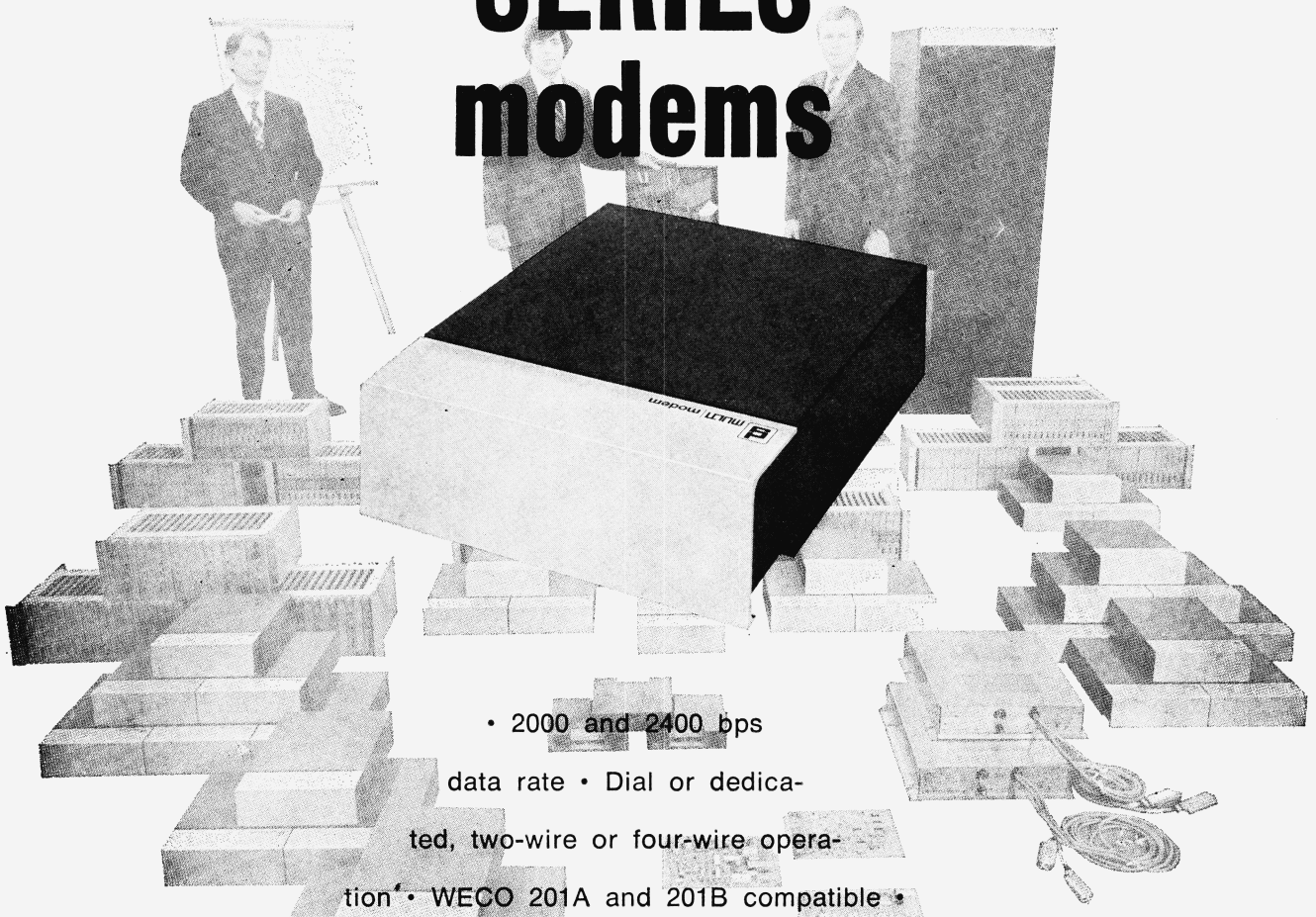

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Circle 39 on Reader Service Card

Impact of ASCII as a Federal Standard To Be Studied By National Bureau of Standards

The National Bureau of Standards, United States Department of Commerce, has launched a study of the significance and impact of the American Standard Code for Information Interchange (ASCII), the first full-scale survey since ASCII's adoption in March 1968 as a mandatory Federal Standard.

Developed to facilitate information interchange among computer installations and communications facilities, the Federal Standard specified that all new computers and related configurations brought into the Federal Inventory be compatible with ASCII.

The NBS study will serve to improve the effectiveness and understanding of the Federal computer standardization process.

Specific objectives of the effort are to highlight the effect of ASCII as a means for increasing the efficiency of Federal computer utilization, and to extend, as necessary, ASCII implementation to meet its intended objectives as stated in several other Federal information processing standards (FIPS publications 1, 2, 3, and 7).

Adopted in 1963

ASCII was adopted as a voluntary American National Standard by the American Standards Association, a predecessor of the American National Standards Institute (ANSI), in 1963. It was revised in 1965, 1967, and 1968. ASCII was adopted as a Federal standard by Presidential approval on March 11, 1968. Implementing instructions for ASCII were promulgated by the Secretary of Commerce on March 7, 1969. The General Services Administration issued instructions for the inclusion of ASCII in Federal procurements in a Federal Property Management Regulation of April 7, 1970. ASCII has also been adopted as an international recommendation by the International Organization for Standardization (ISO) and the Consultative Committee on International Telegraph and Telephone (CCITT).

When ASCII was developed, several character codes had already been implemented by various manufacturers and users: namely BCD, Fieldata, Hollerith, and Baudot codes. Only after a careful review of current coding practices, and after a comprehensive program of original research and code design, was ASCII approved as a voluntary standard. At that time (1963), ASCII was an anticipatory standard. It is a seven-bit code consisting of a set of 128 defined control and graphic characters.

ASCII was adopted to achieve an acceptable standard for information interchange among the many and diverse ADP installations. Additionally, instructions for ASCII implementation (FIPS PUB 7) stated that the introduction of ASCII standards "for character coded and program storage within installations and conversion of appropriate existing files shall also proceed as rapidly as possible."

Achieving Compatibility Through ASCII

The importance of ASCII's adoption and use can clearly be seen in at least three significant areas. These are *computer utilization, computer networking*, and *High-Level Programming Languages*.

Effective and economic computer utilization by Federal agencies is dependent upon compatibility in the interchange of information in machine-processible form within and between information systems. A standard coded character set is a basic requirement for such compatible interchange of information.

Computer technology as manifested by computer networking makes it increasingly difficult to distinguish between information which is always encoded for internal use within an installation and that information that is subject to interchange. Due to the increased benefits derived from networking computer systems, the need for a standard code for all recorded data becomes more apparent.

A primary purpose of high-level programming language standards such as COBOL and FORTRAN is to promote interchangeability of programs for use on a variety of ADP systems. Here, the lack of standard character codes for the data that are processed by compiled programs written in these high-level languages clearly prohibits wide interchange of computer software. This lack of standardization is reflected in different collating sequences of various character codes and the character-sensitive bit-oriented nature of imbedded constants used in writing computer programs.

The NBS Federal Information Processing Standards (FIPS) Program is designed to make computer use more effective by resolving incompatibility problems that exist among equipment, software, computer-generated data, and computer services. ASCII was approved as a Federal standard to help solve some of the major problems of incompatibility.

Specific Issues of the Study

The proposed NBS effort will address the following issues:

● FIPS PUB 7 provides implementation instructions for ASCII and its representation on perforated paper tape and 800-c/in magnetic tape. These instructions state that all computers and related equipment configurations brought into the Federal Government on or after July 1, 1969, must have the capability to use ASCII and be able to receive and generate data on 800-c/in magnetic tapes and perforated paper tape recorded in ASCII. Federal departments and agencies have already been queried for an initial determination of the extent of ASCII implementation. Later queries will address associated conversion difficulties and other related problems.

● FIPS PUB 7 also states that ASCII shall be used whenever data is interchanged between two installations which have equipment conforming to the standard. The extent that ASCII is specified in these interchange situations will be identified.

● FIPS PUB 7 specifies those ASCII related character sets that are permissible for Federal use (that is, basic set, subsets, extended sets, and expanded sets). The present use of these allowable sets and related standardization or implementation problems will be determined.

● FIPS PUB 7 provides procedures for obtaining waivers on implementing ASCII standards. The effectiveness of these procedures for standards management will be ascertained.

● FIPS PUB 7 states that existing computer systems would be converted to ASCII on an evolutionary basis as equipment is replaced, reprogrammed, or redesigned. The extent to which this has occurred will be determined.

● ASCII is a fundamental standard in that it provides a base for the derivation of a family of uniform standards. Other standards necessary to achieve increased compatibility will be decided.

Will Establish Task Group

NBS has overall responsibility for ADP standards management within the government as prescribed by Public Law 85-306. Very important to this function is the identification of difficulties (if any) that Federal computer customers have experienced in complying with new standards. Valuable feedback is thus obtained for on-going standards development projects.

Though ASCII is but one of 17 voluntary standards adopted for Federal use, its *particular significance* lies in its ability to provide a basic character set and codes upon which other standards are based.

NBS believes it essential to determine ASCII's impact as a Federal standard in order to be more effective in its continuing responsibility for Federal Information Processing Standards (FIPS). In particular, NBS considers it vital to protect user investment in automated systems, to improve computer utilization practices, and to encourage computer industry competition and provide for effective information interchange.

To carry out the ASCII study NBS will establish a task group composed of representatives from State and Federal agencies, trade associations, communications and terminal equipment manufacturers, hardware and software producers, and nongovernment user groups. This Federal and industry task group will be organized under the auspices of the Federal Information Processing Standards Coordinating and Advisory Committee, FIPSCAC, an interagency group that advises NBS on ADP standards matters. The chairman of the task group will be Dr. Robert Johnson, vice president for engineering of the Burroughs Corporation and a member of the National Academy of Sciences' Evaluation Panel for the NBS Center for Computer Sciences and Technology.

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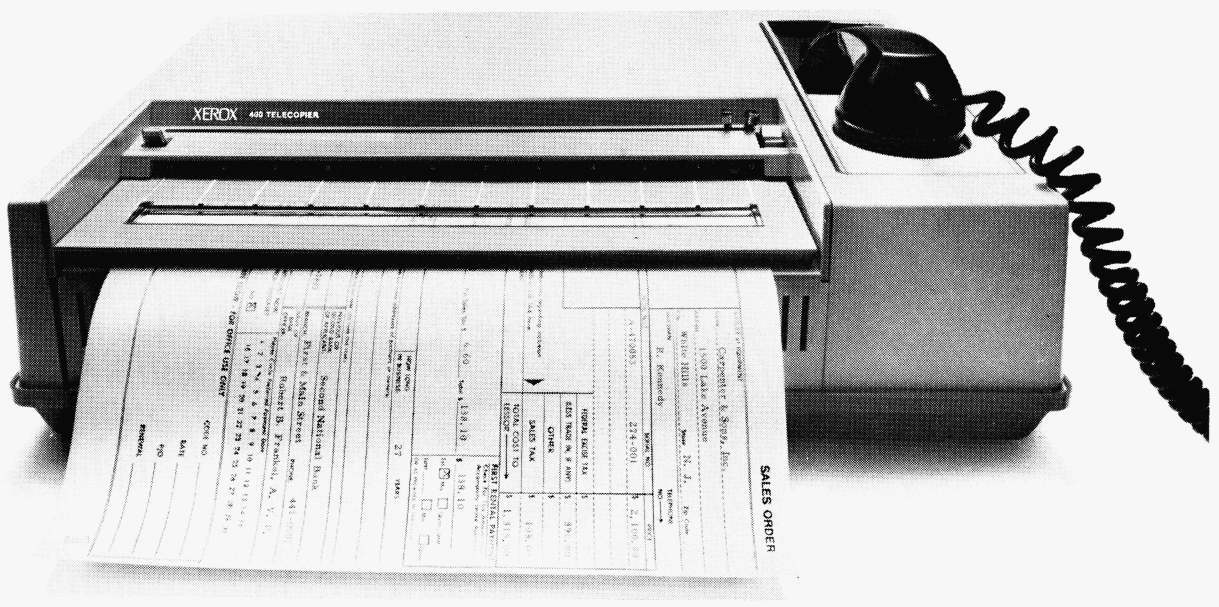

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Circle 40 on Reader Service Card

Johnson County Uses Shared System to Serve Countywide and Local Needs

Creative use of a computer normally used by larger government bodies helps relatively small (Population 220,000) Johnson County, Kansas, to stretch the taxpayer's dollar while promoting efficiency in government on a countywide basis.

The county's remarkably effective, multipurpose system automates most of the basic clerical and accounting functions, consolidates a hodgepodge of record files into a central, readily accessible information source, and extends otherwise unavailable computer capabilities to local municipalities.

Results to date are impressive, the county reports. After two years of planning, the ambitious computer project was put in operation in August, 1969. Johnson County has realized substantial savings in the unit costs of processing real-estate, special-assessment, and personal-property tax transactions. In addition, payroll preparation and voter registration time has been slashed substantially and budget and expenditure control has sharply improved.

Cities within the county, ranging in population from less than 6,000 to over 80,000, benefit from centralized county processing of their payrolls, budget accounts, utility billings, and the like. County officials estimate that participating cities get these services at a cost less than half that of data-processing service bureaus, and at even greater savings than with prior manual methods. More important, perhaps, is the participating city's easy accessibility to the county's continuously updated records on people, property, and finances.

Shared county and city use of an IBM System/370 Model 145 spreads the costs of the computer and makes for closer county/city cooperation. Processing capacity of this powerful computer was recently increased still further by addition of virtual-storage programming. The system today offers cost-saving opportunities in a multitude of government functions, while reducing the probability of future increases in personnel requirements at both the county and city level.

Consolidation of Records

Johnson County officials agree that the system's present and potential contribution to efficiency in government operations is important, but they believe the major payout from their computer investment lies in the emergence of dynamic management information concepts in the government environment. With the new system, frequently duplicated record files maintained by individual departments are supplanted by a single set of master files, under computer control and continually updated as transactions occur to reflect current status.

"The computer's master record files are current to yesterday's transactions," explains Rex Price, a senior member of the County Board of Commissioners who has been involved with the system since its initial conception. "The wealth of planning and control information in this central repository is always accurate and up to date."

Much of the most commonly needed information stored by the system is instantly accessible to officials via special inquiry terminals. Keying a simple inquiry code will call out a visual screen display of the precise information the official needs.

Commissioner Robert Davis explained the need for this on-line, central-data-base concept: "A major source of waste and inefficiency in government is the proliferation of similar, often identical records in various departments and at different governmental levels. For instance, the County Assessor, the County Clerk, and the County Treasurer often all keep records relating to real property. At least a portion of this same basic record data is maintained by the cities within the county.

"This is costly and inefficient, because all of the records in different places are updated at different intervals and often are not in accord. This is a source of irritation to the taxpayer, who frequently must contact three or four different departments to obtain the information he requires. Our approach does away with this by establishing a countywide data base, centrally maintained and available to all officials and departments."

Constructing a Data Base

How far along is Johnson County in implementing this advanced management information concept? Ronald Paul, director of data processing and a principal architect of the system, says that a major portion of the essential data base is now stored on random-access, magnetic disks under computer control. These "electronic files" are updated to reflect current situations, and are available for routine processing and to generate a variety of control and planning reports, operating summaries, billing notices, payment receipts, and so on.

Much of the information encompassed in the data base already is "on-line," that is, accessible to virtually instant retrieval via any of the eight IBM 2260 visual-display terminals located in various departments and offices of the County Courthouse at Olathe. These units link county departments directly to the master file records for display of needed information. Currently, the system is handling about 1,200 inquiries a day from the Assessor's, Clerk's, Treasurer's and Data Processing Offices.

The real-estate master file—containing complete identification and ownership data, evaluations, and tax status for some 80,000 parcels of property—is an extremely important segment of the county data base, and the most actively tapped. This file is organized to provide valuation data for the Assessor's Office and the tax rolls for the Treasurer's Office.

How System Is Used

Using the 2260 terminal, county officials can access the real-estate master for specific property-tax information via a control code based on the property's legal description, by entry of the property owner's name, or by the address of the property. The initial information display will show the name of the owner, the legal description and address of the property, the tax district number, and loan-company identification number, and whether or not a special assessment currently applies to the property.

If a special assessment is indicated, the inquirer hits a special code key and the terminal screen instantly displays the amount of the special assessment, the paid-to-date and remaining balance status, and the rate of interest. By depressing a second code key, the total amount of the yearly tax bill on the property is displayed, along with an indication of whether or not the property owner has paid the first, or the second, or both of the semiannual payments.

Supplementing the real-estate master file is a control file of assessments and accounts receivable by tax district. This is a record of current land and improvement values for each of the county's 225 tax districts, broken down into five different property classifications—private, commercial, government, nonprofit, and state-assessed. Via the inquiry terminal, an official can determine the current assessor's valuation and tax status and other relevant data.

Another control file is maintained for special assessments so that county officials can check at any time the current status of assessments by individual benefit district. The personal-property-tax role of some 90,000 accounts also makes up an important segment of the Johnson County data base, and is subject to a heavy flow of inquiries seeking current taxpayer billing and payment status.

Data on budgeted county funds is kept current by fund, department, and line item on the budget master file. Inquiry produces a display of fund amount, encumbrances and expenditures to date, and remaining balance. This is regarded as a key file for monetary control.

Donald Pipes (center), city manager of Overland Park, Kansas, and Ray Riley (right), city manager of Olathe, Kansas, examine one of the eight IBM 2260 visual-display terminals used by the county for instant display of information from computer master files. Ronald Paul, Johnson County director of data processing, explains the procedure in using the terminal for information inquiry.

Services to Cities

The on-line, central-data-base concept has strong appeal for government officials of the three cities within Johnson County that currently are being serviced. The largest of these is Overland Park, with a population of more than 80,000. The smallest is Lenexa, population just over 5,000, and the third is Olathe, population 18,000, the county seat.

City officials are pleased with the results of their shared-time computer projects. Says Ray Riley, Olathe city manager: "We used to have four girls working for two weeks to calculate the water bills for our city utility. Now, the county computer does the job in about six hours. We supply the meter reading and account payment status data, and the county gives us back the individual customer bills ready for mailing and a full accounts-receivable record."

City Manager Donald Pipes of Overland Park, the largest municipality within Johnson County, is impressed with reduction of payroll preparation time from four days to about five hours. The advantages of computer use there have triggered plans for automating other voluminous city recordkeeping tasks, such as licensing, accounts payable, court dockets, and budget accounting.

Other Johnson County municipalities are expected to make use of the computer services, thus further spreading the costs, and consideration is being given to extending computer time beyond the borders of the county to neighboring Kansas counties and cities within those counties.

The county's director of data processing, Ron Paul, is pleased at the rapid progress Johnson County data processing has made in a short time. "We had no programmers on our staff until shortly before the computer was installed," he recalls. "Since then, we have trained six programmers and written more than 150 application programs. We also have developed a good portion of the county-wide data base and put much of this on-line to county officials."

An IBM program package called FASTER (Filing and Source Data Entry Technique for Easier Retrieval) made it easier for the data processing staff to program for a terminal-oriented data entry and retrieval system, according to Paul, and visits to other county and city computer installations also helped. He also credits a skilled staff, the close cooperation of county department heads, and the full support of the Board of Commissioners for the system's progress.

"The concept of central information files always accessible to all departments and levels of government is integral to the kind of streamlined management required by a dynamically expanding county," says Commissioner Price. "In the last few years, Johnson County has shifted from rural to urban orientation as a vital part of the mushrooming Kansas City suburbia. The county ranks as one of the nation's most affluent, and a very high percentage of its residents are well-educated people who demand efficiency in government procedures and sophistication in government services."

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Circle 41 on Reader Service Card

Varian Vacuum Division Uses Tymshare Data Communications to Automate Sales-Order Flow

Varian Associates is using the data-communications facilities of one of its prime OEM customers, Tymshare, Incorporated, to translate its vacuum product sales orders into "hair-trigger" response at relatively low cost.

This "piggyback" approach, though frequently overlooked, may well be recommended to increasing numbers of firms evaluating available data-communications options in the future.

Few could have correctly foreseen the evolution of the concept. Tymshare was in the business of selling shared computer facilities, distributing computer processing by phone line. At first, the experts said it wouldn't sell; then that it wouldn't be profitable. Both proved wrong. In the Sixties, Tymshare became one of the hottest, most successful time-sharing independents in the industry. In the early Seventies, while much of the computer industry suffered through the recession, the use of time sharing became more prevalent. Tymshare expanded its base by ringing the nation with over 40,000 miles of Bell System leased lines, connecting four major computer utility centers, interconnected to satellite processing sites, offering immediate access to users in any metropolitan area.

A fast minicomputer designed by Varian Data Machines, a subsidiary of Varian Associates, played a crucial role in Tymshare's growing web of data communications. To transmit digital data over voice-grade lines more efficiently, Tymshare stationed Varian 620 minicomputers on either end of a given leased line. At a remote site, the 620 concentrated data from low-speed communication links of multiaccess users nearby. The concentrated data was then sent over high-speed transmission to one of Tymshare's major computer centers for processing. At the center, another 620 served as a preprocessor, primarily relieving host computers from dealing with continual interrupts.

In addition, the Varian 620, i and L models, with 8K and 12K core memories, also performed error detection and correction, data formatting, and telephone-line routing. The system leveled the computing load and policed circuit traffic automatically. Along with Tymshare software and special interfacing, the network combined a high degree of self-modifying "intelligence."

As the ring configuration developed, Tymshare purchased and integrated over 100 Varian 620 minicomputers into the nationwide Tymnet system.

Solves Sticky Problem

Meanwhile in another division of the Varian organization, the Vacuum Division studied the Tymshare network with a view toward solving a very sticky communications problem at minimum cost and programming development.

Varian's Vacuum Division processes more than 25,000 orders annually on more than 2,000 different products. Prices and specifications vary widely, from a few dollars up to $200,000.

Sales offices cover the nation. Manufacturing originates in two plants—Newton, Massachusetts, and at the home office location in Palo Alto, California. With over 2,000 orders per month pouring in from 10 field sales offices by teletype, mail, and phone, some mix-ups and delays in processing seemed to be par for the course. But customers rarely share that point of view.

The new Tymshare system immediately improved two-way communications between field sales and home office. Most important, computerized order entry has virtually eliminated human error and slashed sales reaction time from a matter of days to hours. Whether in Tampa, Boston, Los Angeles, or Cleveland, the Varian Vacuum Division salesman knows that his order will be processed without delay. From his field-office terminal, he can instantly determine product status information, such as current inventory levels, exact shipping dates, revised discount schedules, and the latest pricing.

The effect has been to sharpen the edge of every sales discussion. It's about as sophisticated as any private-data-communications system available. Yet implementation and operation have been relatively simple from Varian's vantage point.

Because all information is entered and received in plain English, no special training of operations personnel has been required.

Entry into the system is as straight-forward as the previous Teletype approach. At the sales office, you dial a local number, place the phone in its acoustical coupler cradle, then transmit order information in nonprogramming language via a teletypewriter keyboard.

At both ends of the line, the information is in English. Enroute, however, the data is digitized, disassembled, reassembled, and variously massaged at blinding speeds. It goes through at least two Varian 620s, one on each end of the leased line; some very sophisticated Tymshare supervisory programming; into a host computer; and onto disk memory at the Tymshare computer center in Cupertino. The salesman doesn't see any evidence of this, nor does the secretary receiving the order in Palo Alto. The technology is transparent. But one hour after the salesman picks up the phone in the field, his order is in the Vacuum Division's shipping department.

The Tymshare host computer clocks the microseconds used by Varian and charges accordingly.

In addition to faster responses to sales orders, Varian's Vacuum Division enjoys many add-on advantages of the Tymshare network. Designed into the ring configuration are numerous procedures for "fail-soft," error detection, and alternate routing. If a telephone line is down, or a host computer is off the air, Tymshare's Tymnet automatically creates alternate data paths to get the job done. According to a Tymshare technical representative, network reliability is less than one error in four billion bits.

Also, machine-enforced credit checking is programmed into order processing. If an order comes in from a new customer not on the stored list, a notice will be generated and sent to the Varian credit office.

Since all orders are captured on disk memory, sales information is not garbled, lost, or misplaced. When an employee at Varian headquarters in Palo Alto wishes to sweep all incoming orders from the Tymshare computer center, he merely dials in and receives complete, timely data at once.

Must Plan for Continual Evolution

Experience in data communications networks indicates that plans should be made for continual evolution in types and placement of remote terminals. In the Tymshare network, virtually no limitations are imposed upon terminal usage, whether the customer elects to use teletypewriter links, data phones or CRT's, regardless of varying speeds and equipment family.

With growing export sales in Europe, Varian Vacuum Division is now exploring Tymshare's trans-Atlantic data link to speed orders and delivery overseas. If European and United States offices use different transmission codes, the Tymshare network is already programmed to handle ASCII, EBCDIC, Correspondence, or Baudot. As with differences in speeds, the Tymshare supervisory software accommodates all line requirements so that they are transparent to their users.

According to Bill Oliver, chief business-systems specialist for the Varian Vacuum Division, "Our customers throughout the United States have an efficient, one-stop 'supermarket' approach to purchasing. It's fast, accurate, and cost-effective. Before the end of next year, I predict that European sales will also be linked into Tymshare."

Tymshare's trans-Atlantic data link that allows the United States and European operations of multinational firms to have local phone-call access to decision making data regardless of time zones was announced recently by Tymshare and its European affiliate in Paris, CEGOS-Tymshare.

Dedicated telephone facilities between New York and Paris were implemented. These, combined with the computing and communications network facilities Tymshare has developed over the past six years for its more than 1500 current clients, now make it possible for users in most major cities in the United States and from several major European cities to have local-telephone-call access to the same computers, programs, and data bases for immediate processing of the information multinational firms typically need for key decision-making activities.

"This new international service offers major advantages to firms operating both in the United States and European markets," said Alden Heintz, Tymshare's vice president for international operations.

. . . Mobile Facsimile. Photos, maps, handwritten messages, sketches, warrants; any graphic material can now be transmitted directly to patrol cars over existing FM radio channels along with voice messages.

The system features fully automatic, unattended operation faster than a teleprinter. Field tests have shown Mobile Facsimile works even when voice is unintelligible at high speeds or in weak signal areas.

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Circle 42 on Reader Service Card

Jordan Supply Uses Keydata Network to Process Invoices and Control Inventory

Jordan Supply Company of Buffalo, New York, one of the leading refrigerant wholesalers in the United States, uses modern business time-saving techniques to grow steadily along with its burgeoning industry. One of these techniques is the Keydata network, which provides multilocation users the ability to process invoices and maintain inventory control at the branch level, yet at the same time provides corporate headquarters total control over locations by the use of a single data base. The Keydata telecommunications network was developed to provide large companies, with many geographic locations, simultaneous, yet independent, access to a central data base at the Keydata Computer Center.

The Keydata network makes it economically feasible for Jordan and other companies with multilocations to operate in a real-time mode from a common data base, interact with each other on a second-by-second basis, and to have the entire multilocation data-processing functions monitored by corporate headquarters. With a centralized accounting and inventory function, Jordan's corporate management has the ability to review branch sales activity, and to inquire into any branch location or all locations to determine movement, availability, and position of inventory. The network also provides for an English-language message system allowing interbranch or corporate-to-branch communiques.

"In our business, it is necessary for us to carry a large, although selective, inventory of everything from electrical, air-conditioning, heating, and plumbing components to various mechanics such as pulleys, gears, and so on," says Tom Jordan, president of Jordan Supply Company. "When our customers place an order they expect it to be filled immediately if not sooner. And for good reason! If a food-processing plant breaks down, the customer needs the necessary parts to get that plant going again, and he needs them fast. Our inability to fill our customer's needs quickly and efficiently could, in some cases, wipe him out. Therefore, we have a great burden of responsibility to keep adequate inventory on hand at all times.

"Prior to installing the Keydata system, we ordered our inventory by the 'eyeball and sixth-sense arrangement,'" says Jordan. "For the most part, we ordered by feel. When it got to be the season and when our records showed some movement of specific parts, we would order.

"Before we decided on the Keydata system, we studied various other systems on the market, but none of them seemed to fit," continued Jordan. They were designed for companies with extremely large turnover situations. We have a lot of inventory that doesn't turn over that fast, and yet it's very important for us to stock it. It's also important to the company, since it ties up a substantial amount of working capital. All of the systems we looked at seemed to be rather cumbersome and time-consuming for the amount of information we would be getting out of them.

"After seeing Keydata and its many possibilities, we elected to use the system, and it is working out very satisfactorily," says Jordan. "With the Keydata system, we've had instantaneous control of inventory and sales activities of our two branch operations in Syracuse, New York and Erie, Pennsylvania—perhaps the most important aspect of running a profitable business."

Management Information System

Because of its real-time random-access characteristics, the Keydata system makes available to Jordan a true management information system. It maintains accurate values of such elements as inventory levels and accounts-receivable balances, current to the last transaction processed, and makes this information immediately available upon inquiry. The Keydata system provides random-access storage for information which Jordan wishes to maintain with up-to-the-minute currency and permits inquiry into any of these records; by entering an inquiry code and an identification number, an operator at Jordan can cause all the information desired to be printed on her Keydata information entry terminal.

The Keydata management information system also performs certain decision-making functions and reports instantaneously when any controllable items are out of balance. A simple example of this ability is the manner in which the Keydata information entry terminal checks inventory levels after each transaction to determine if a reorder condition exists, or Jordan's credit level before or after each invoice is prepared to determine if Jordan has exceeded its credit limit. In either case the Keydata information entry terminal automatically types out an exception notice on an auxiliary printer, giving all the information required to take immediate corrective action.

"With the help of the Keydata services, we can immediately follow up sales with the replacement of stock," says Jordan. "Heretofore, we had to spot-load shelves, listen to each branch manager's requests for inventory, and do our best from the hand postings. Now, things are different. Now when an item is sold in Syracuse today, we can begin making arrangements to replace it from our main inventory in Buffalo tomorrow, with little or no wasted time."

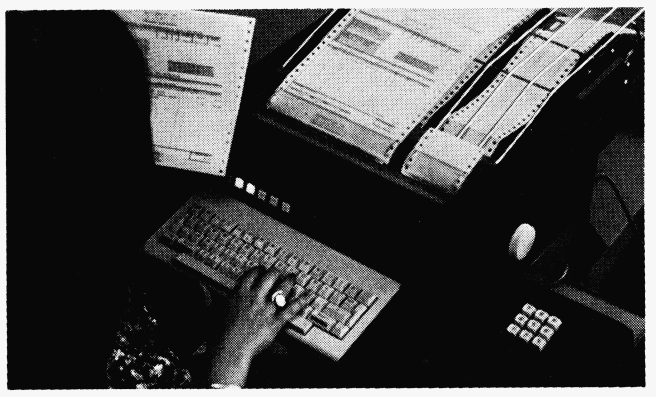
The extent to which any data-processing system satisfactorily meets the requirements of a management information system is largely a function of the speed with which information is entered into the former system and by the ease and speed with which questions or inquiries can be asked and exception notices prepared. The Keydata system acquires information at the earliest possible moment on a transaction-by-transaction basis. Furthermore, the Keydata information entry terminal at Jordan provides a continuous means of answering inquiries and printing out exception notices the moment they occur with no disruption of the procedure being performed.

Connected via Message Concentrator

Jordan's information entry terminals, as well as the terminals of other Keydata subscribers, are connected directly to a Honeywell DDP-516 message concentrator, which in turn is connected by standard voice telephone circuits to a Univac 494 real-time system, consisting of a central processor, peripheral magnetic-drum and magnetic-tape subsystems, a peripheral processor, and communications equipment. A Standard Communication Subsystem (SCS) enables the 494 central processor to receive and transmit data via any common carrier in any of the standard codes and at any of the standard transmission rates up to 4,800 bits per second. The SCS can control 16 DDP-516 computers via line terminals or direct connection. Two DDP-516s serve as front-end processors for the 494, each being capable of controlling 128 Keydata information entry terminals or other special devices. All special logic required to handle these devices is integral to the DDP-516 handler programs, thereby relieving the 494 of this responsibility. The DDP-516 incorporates 12,288 16-bit words (expandable to 32,196), with a 960-nanosecond cycle time.

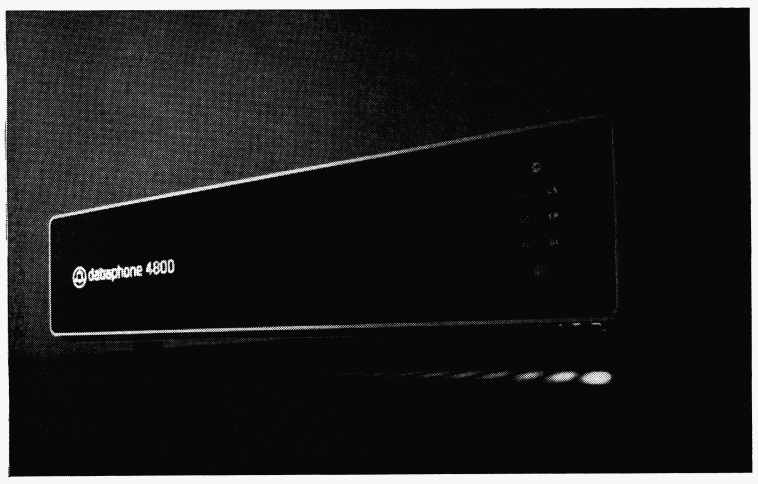
Included in the services provided to Jordan and other subscribers by Keydata are periodic reports produced on an IBM System/360 Model 40 computer. These range from aged trial balances, statements, commission reports, and a variety of registers for accounting purposes to stock status and product sales reports for inventory control.

This off-line processing is done by a unique file-management system that accumulates journal and file information from the on-line system and, at scheduled intervals determined by Jordan and other Keydata subscribers, prepares printed reports or tape outputs according to the subscriber requirements. As these reports are prepared, information is accumulated, summarized, and saved for later use or for other hierarchies of reports.



Invoices are printed on Keydata's new information entry terminal at 30 characters per second. The simplified 10-key pad is used to enter incoming orders.

Introducing the 4800, first in a new family of data sets from the Bell System.



The Bell System's new solid state 4800 data set is designed for transmission at 4800 b.p.s.—and it's economical.

This set cuts transmission costs three ways. First, the charge for the set itself is low.

Second, an automatic equalization feature makes it possible to transmit at 4800 b.p.s. over basic, *unconditioned,* private-line facilities.

Third, it features rapid startup and turn around—ideal for polling applications.

This new, compact data set also offers the convenience of local and remote loop-back testing as well as status indicating lamps.

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Monarch Foods Streamlines Inventory Control with Data Communications System

Monarch Institutional Foods/Pearce Young Angel Company, a division of Consolidated Foods Corporation, has developed an advanced communications system which is enabling it to cut costs significantly and maintain 24-hour updates on inventories in many of its branch offices around the country.

Headquartered in Greenville, South Carolina, Monarch/PYA provides food and related items for schools and many other institutions involved in volume feeding. Since this involves more than 3,000 different kinds of food daily, many of them perishable, the company implemented a data-processing network in order to streamline its inventory procedures and management operations.

As James Holliday, data-processing manager, explains, "A large portion of our business is based on quick service. It's not unusual for a school to serve dinner with supplies we brought them in the morning. It's important, therefore, that we buy and sell at a profit. With prices as high as they are today, that's not easy without good inventory control."

Holliday explains that prior to the installation of the data network, all orders and billing procedures were handwritten. "It was a slow process and didn't give us tight enough control. We realized all of this had to change and called in Southern Bell Telephone Company to see if they could come up with some ideas about an advanced communications system which would solve some of our problems. We're very pleased with the data communications system they suggested."

Monarch/PYA Foods has 20 branch offices scattered throughout the country which operate as individual profit centers. Currently, the most active offices are keyed into the data-processing network. By Fall of 1973 the company plans to have 16 offices participating.

Call Made over WATS

Here's how it works: At company headquarters there are two Burroughs master computers (one used for back-up should the other fail), operating on a 24-hour basis. By the use of Southern Bell Automatic Calling Units, the computer calls each of the branch offices on the average of every 7-10 minutes. General operating information as well as order information is retrieved. All calls are made over Monarch/PYA's Wide Area Telecommunications Service (WATS).

Electronic transmission of data is sent by Dataphone data sets. "We only have eight branches currently on the system," Holliday points out, "yet we process about 25,000 invoices a week—something which was humanly impossible prior to this system."

The actual order retrieval procedure of the system is quite simple. For example, when a regional salesman returns from the field, he turns in daily orders which are key-punched into cards and fed to the minicomputer at his branch office. When the master computer calls from Greenville, order information is transmitted back over the Dataphone to headquarters.

The computer then compiles and stores the information until processing is ready to begin. By daybreak the following day the trucks are on the road delivering the orders. The process cycles this way 24 hours, 7 days a week.

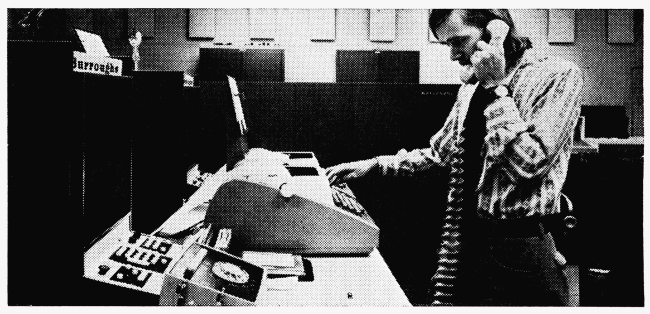
Gives Continual Updates

"This system has really streamlined our operations," comments James Pearce, President and Chief Operating Officer of Monarch/PYA. Moreover, the computer can also give management a summary on what each branch is doing. Weekly reports are given every Friday and also comprehensive monthly reports. Prior to the innovation of this system, this was done on a quarterly basis and was not nearly as complete as it is now.

By measuring branches this way, it is much easier to review their progress. These detailed reports also enable branch management to take quick action on situations not satisfactory to the welfare of the company. For example, products that are not selling well show up very quickly through inventory analysis at the individual branches. In addition, sales progress can be easily measured as well as sales estimates.

Putting this advanced system into operation required a great deal of preplanning and cooperation on the part of the Bell System and the company. "Naturally, we had mechanical and technical problems in the beginning," says Pearce, "and wanted to jump on everybody who had anything to do with it. But all in all Southern Bell has been most cooperative. They worked with us very closely and deserve a great deal of praise for the progress we've made so far.

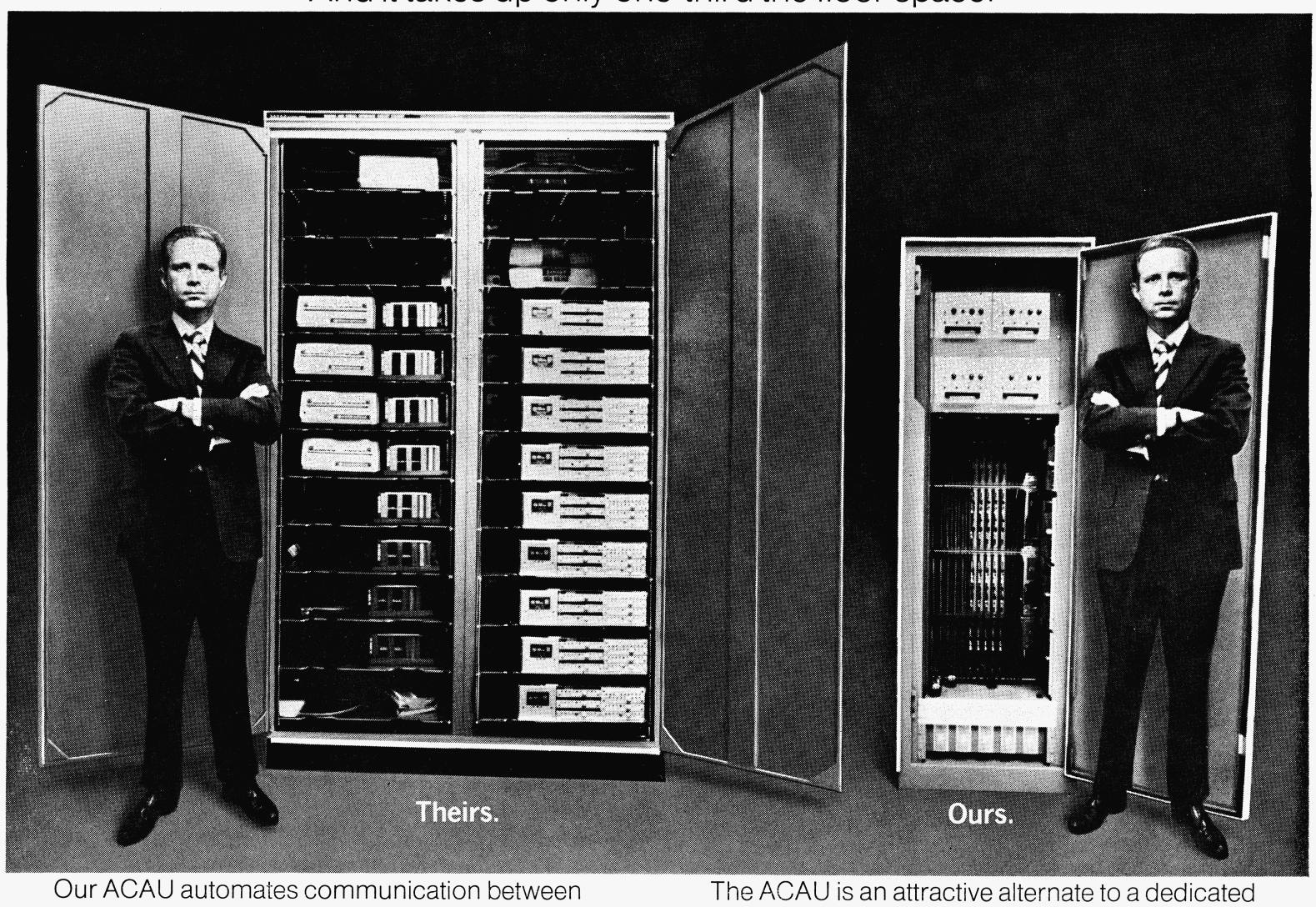
"With better control over our inventory and accounts receivable, we truly feel that this system is bound to achieve sizable economies, right now and also in the future."



The operating manager in this picture oversees the computer room at Monarch Institutional Foods/Pearce Young Angel Company, a division of Consolidated Foods Corporation. Monarch/PYA is the first food service institution to install and utilize a highly advanced communications system designed by Southern Bell Telephone Company. The data-processing network aids the company by cutting down on costs while maintaining 24-hour updates on inventories. With 20 branch offices scattered around the country, eight of the main branches are keyed into the network. By Fall of next year 16 branches are expected to participate.

Our automatic calling and answering unit costs 20% less than the Bell system unit.

And it takes up only one-third the floor space.



Our ACAU automates communication between computers or data terminals. It eliminates the need for an operator by putting calling and answering under computer control.

Ma Bell has a unit that does the same job. But ours costs less and saves space.

Here are some of the job details:

The ACAU allows automatic polling and selecting of remote terminals by the computer through the switched network. Dialing by computer makes it possible to call terminals when long-distance rates are low and computer time is available.

The ACAU is an attractive alternate to a dedicated system because you pay for transmission only when you use it. With the ACAU your computer can communicate with Data-Phone* acoustic-coupled, TWX and DAA-connected terminals. Two models are available: Model 300 for speeds to 300 b.p.s. and Model 1200 for speeds to 1200 b.p.s.

Installation and maintenance are easy. Various options are available. The nitty-gritty are described in a brochure available from John Walters at Teleprocessing Industries, Inc., 82 McKee Drive, Mahwah, N.J. 07430. Phone 201-529-4600. Telex 138953. A Western Union subsidiary.

*Registered trademark of A.T.&T.

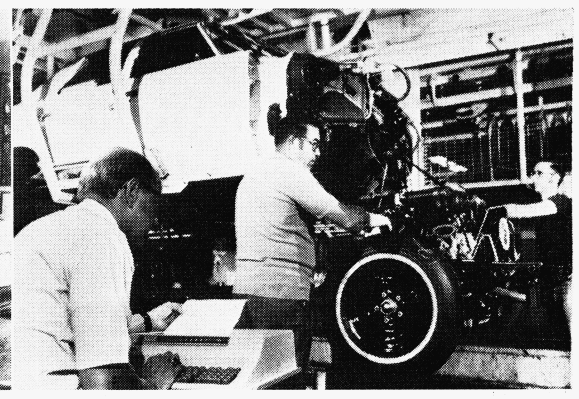
Western Union's Teleprocessing Industries, Inc.

We teach computers how to communicate.

Circle 44 on Realer Service Card

Pontiac Dealers Get Delivery Status with Remote Terminals

Instant car-status information is available through an Execuport terminal in a Pontiac dealer's showroom. When a customer enquires about the delivery date of his or her new car, the dealer uses the terminal to obtain the information.



An Execuport terminal in use on a General Motors Pontiac Division assembly line. Terminals record production progress of individual cars, making it possible to have updated data available to dealers with up-to-the-hour accuracy.

GM's Pontiac Motor Division has implemented a new nationwide TRACE computer system for providing production-delivery status reports on customer new-car orders.

TRACE (Terminal Request for Action on Car Events) utilizes computer terminals in showrooms and offices that communicate directly with a computer system making it possible for Pontiac dealers and customers throughout the United States to make direct inquiries and get instant answers regarding delivery status. The terminals send and receive information from computers over ordinary telephone lines.

The remote computer terminals provide access to General Electric's 250-city, local telephone access-by-terminal-to-computer network which is on-line as the data collection and processing system for Pontiac's IBM System/370 Model 155 batch-processing in-house system. This system processes car-assembly data for all vehicles in Pontiac's national order bank.

The TRACE system was developed at Pontiac by A. J. Cattell, coordinator-order response, who indicates, "One of the chief problems of the automotive industry traditionally has been that of matching production schedules to customer expectations. For this reason, one of the foremost objectives we have for the TRACE system is to enable sales personnel using terminals in Pontiac dealer and zone offices across the country to access a central file of processed information to determine immediately where a given customer vehicle is in the production-distribution cycle, and when delivery can be expected."

All car orders from Pontiac's 3,300 dealers flow through 27 zone offices. To date every zone and 400 dealer offices are accessing the network with terminals. "We anticipate selling 800,000 cars this model year, which means many people on any given day are bound to be asking, 'Where's my car?'" Cattell says. "And then," he adds, "that can be a tough question to answer, especially when there may be 100,000 customer orders in the system." The favorable response of Pontiac sales personnel to the new system indicates they see its immediate value in answering the tough question.

Pontiac's terminal access system replaces the more primitive but traditional manual system in which one person contacts another to check on a car's location in the cycle, and then the individual contacted has to ask someone else, and so on, all involving upwards of 1,500 tracer communications daily throughout the company.

A key to the successful implementation of the system has been the operating simplicity of terminals used in showrooms. With no specialized training, regular showroom personnel have been able to quickly master the operation of the terminals. The Execuport terminal shown operating in a Pontiac showroom (see left photo) was developed by Computer Transceiver Systems. It is a completely portable terminal that can be quickly set up to operate with maximum effectiveness in any location in an office or showroom where an ordinary electrical outlet and telephone are available. If necessary, a dealer or salesman can easily transport the less-than-30-pound terminal in a specially fitted attache-type carrying case (right photo).

General Electric's data-processing network handles data acquisition, processing, and distribution for some 1,000 sales-office inquiries a day. The GE network system consists of a parallel array of large-scale central processors with GE-4020 process-control computers that control data flow between the terminals, files, and processors.

The TRACE procedure works this way. As a Pontiac takes shape on a General Motors Pontiac Division assembly line, production progress is recorded and inputted into the computerized file via an Execuport terminal, updating the data base stored in GE's network. Overnight, Pontiac's data-processing center in Pontiac, Michigan, compiles file change status for all cars in the order-production-distribution cycle. Pontiac's total data-collection system provides transact recorders at strategic points in the cycle to capture car status changes on magnetic tape in 11 production facilities. It is relayed via telephone lines to the data-processing center in Pontiac, where it is merged into a single file covering new-car order status.

In the morning, with additions and changes of data now on magnetic tape, Pontiac transmits the fresh information via telephone lines through a Honeywell 760 key tape to GE's network computer center in Cleveland, Ohio. There, the data is received on an identical key tape. It is loaded from that magnetic tape into the update files on the GE system. Update files are then processed against the eight-million-character master file to provide an updated file for use that day.

Pontiac has a production rate of about 3,300 vehicles per day. TRACE, as a program, is built on a structure of seven events through which those 3,300 cars travel: (1) the order is written by the salesman; (2) the dealer submits the order to the zone office; (3) the zone sends its orders to the production plant; (4) a given plant makes the car; (5) the ordered car is okayed for shipment; (6) the car is shipped; and (7) the dealer receives the car.

A person making an inquiry as to a car's status from a terminal in a dealer or zone office only has to index his dealer (user) number, be validated (by the system), give his car order number, and then watch the printout as it lists verification of the order, model, plant where the car is being produced, serial number, date of status, status (whether it was shipped or not), the rail car number, and finally the ramp-location symbol.

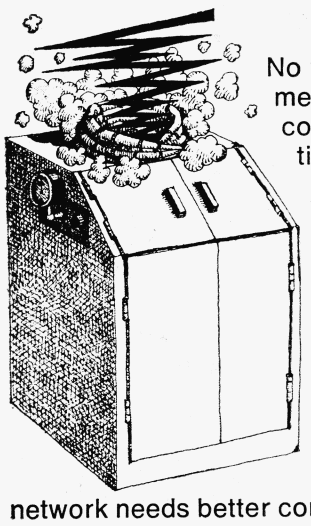
At the end of the business day a summary of transactions is compiled and transmitted to Pontiac for analysis. One of the more obvious advantages to the system is that when a certain vehicle is "way-off" delivery date, Pontiac can work out a solution at the trouble spot right away. "Bumps" that may rise throughout the entire vehicle flow are also obvious from this summary.

By showing the exact status of the order, TRACE enables the dealer to expedite the order through the zone office if there is an unscheduled delay. Also, zone office personnel responsible for monitoring production and distribution and delivery schedules can be expected to be checking on all zone orders periodically. Consequently, TRACE makes it possible to pinpoint bottlenecks and alert the appropriate personnel of existing problems.

Cattell emphasizes, "It is more apparent to everyone in the plants and zone and dealer offices that our customers not only are anxious to get delivery on their cars, but they want to know when they're going to get them. If they are not satisfied with the delivery date, it becomes a source of irritation and threatens the good relations our dealers normally have with their customers. TRACE enables us to give them satisfaction immediately."

The ability to update economically very large data bases is the key to success in this kind of application. In many cases only a small portion of the data base must be modified on a daily basis and it is feasible to transmit this update information over voice-grade telephone lines. Updates can be performed economically.

If your signals get out of condition, we'll help put them back in shape.

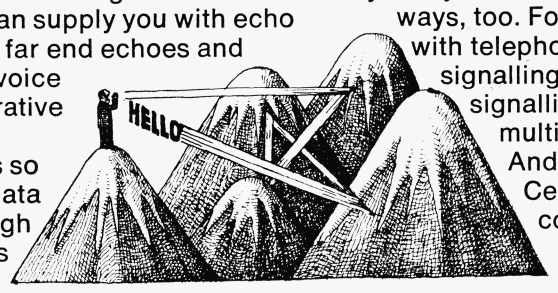


No matter what transmission media you use for your communications system, from time to time you're bound to have problems.

Far end echoes may cut down clarity of your voice reception. Or your signal level may drop off, giving a loss of data. Or you may have to raise the level of the aggregate receive or send lines in a multi-channel system.

That's when your network needs better conditioning or control. And that's when you need Singer Tele-Signal.

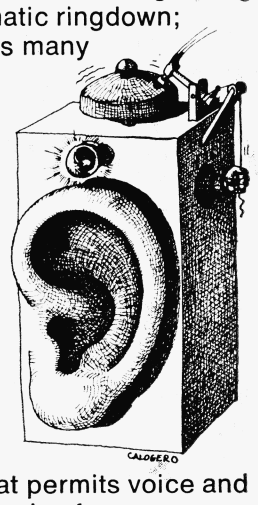
Take signal *quality*. We can supply you with echo suppressors that reduce all far end echoes and give greater clarity in your voice reception. And with regenerative repeaters that reshape and regenerate defective pulses so you can transmit accurate data and telegraphy signals at high speeds over great distances without distortion. We can also supply amplifiers, phase and amplitude equalizers, attenuation pads.



Or maybe you want to *monitor* your signal levels. Singer Tele-Signal can furnish you with tone monitors that sense small db drops, then transfer the system to standby and activate an alarm signal. We can furnish you with dual tone monitors that sense large or total losses of tone and activate an alarm. And with audio signal monitors that include amplifier, loudspeaker and a lamp that lights when the signal drops.

Tele-Signal products also come in a wide variety to meet signal *control* requirements. For example, if you have inband signalling problems, we can equip you with a unit that interfaces a 4-wire trunk circuit to a 2-wire/4-wire line circuit in any one of the most common trunk and line signalling modes: E&M signalling; automatic ringdown; or 20Hz manual ringdown. Plus many other options.

Does your voice frequency channel require a flexible terminating device? We produce 2-wire and 4-wire units of highest quality, assuring you of dependable service with an attenuation of less than 4 db from 300 to 3400 Hz.



Tele-Signal can "beef up" your system in many other ways, too. For instance with telephone signalling equipment that permits voice and signalling traffic over voice frequency multiplex gear or other long line carriers. And with our Network Management Centers. And with turnkey communications systems for EDP networks, high frequency, voice plus data, time sharing, voice privacy and reservation networks.

We've done it for big companies like RCA Global, American Airlines, Radio Swiss, FAA, NASA and the U.S. military services.

And we'll provide service and personnel training anywhere throughout the world.

To see how easy it is to put your communications system in tip-top shape, contact us for information about your application, or complete literature. Write the Singer Company, Kearfott Division, Tele-Signal Operation, 250 Crossways Park Drive, Woodbury, N.Y. 11797.
Or phone (516) 921-9400.

SINGER
AEROSPACE & MARINE SYSTEMS
Circle 45 on Reader Service Card

Union Carbide Updates Net with Mux System

How do you design a communications network that starts with a message load of 20,000 per day yet can accommodate 100 percent growth per year and allow continuous upgrading from five-level/75-baud to eight-level/110-baud terminals without incurring heavy costs for new communications gear at every change-over?

Union Carbide presented this problem to New York Telephone when it decided to replace a five-year-old system with a new, more powerful, and, more important, more flexible system to meet these anticipated growth needs.

Old System Could Not Handle Traffic

Although the old system performed exactly to specifications, it was simply a five-level-code teletypewriter system and was limited to a speed of 75 baud. It did provide both 81D1 full-duplex operations, but it couldn't handle the traffic that Union Carbide predicted and it offered no flexibility in data rates to accommodate anticipated conversions to higher speed channels.

The new communications network that New York Telephone designed has its heart in Union Carbide's Tarrytown, New York regional computer center. New York Telephone found a cost-effective solution to the flexibility problem by multiplexing Union Carbide's message network channels with FDM equipment designed and manufactured by Data Products, Stelma Telecommunications Division.

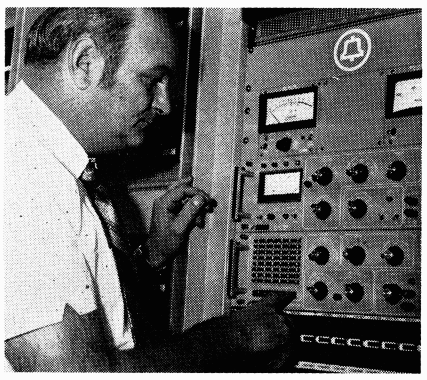
With this system, four voice-grade lines provide seventy 75-baud channels with easy expandibility to 110-baud channels. The modular construction of the multiplex equipment, called DataPak, solved the problem of changing data rates of channels. When a channel is changed from five-level to eight-level, or to any other speed for that matter, instead of replacing an entire multiplexing unit, channel speeds on a DataPak can be changed by simple replacement of plug-in cards.

Channel Makeup Is Flexible

The Western Electric 1A data station, normally supplied by Telco, costs less than the Data Products unit, channel-for-channel, but the DataPak's flexibility in channel makeup offered the telephone company savings in the overall system. Channels can be added, and data speeds or frequency allocations changed by simply exchanging plug-in circuit cards. And the loop interface can be EIA standard or 60- or 20-mil loop, current-regulated.

The multiplexer also offered New York Telephone lower installation costs because it was purchased preassembled. And it includes built-in features and indicators that the 1A doesn't have.

The DataPak's built-in test features and indicators provide further benefits to both the telephone company and Union Carbide. The multiplexing equipment is installed on Union Carbide's premises in Tarrytown. Though this is a marked departure from normal procedure, the presence of the multiplex bay with built-in test equipment, patch field, and status indicator lights for each channel, in the Carbide Telecommunications equipment room, allows Union Carbide operators to check circuit integrity at a glance. The indicator lights display all channel activity and, along with the test equipment and patch field, make trouble-shooting easy. If a channel should fail, simple checks allow the maintenance staff at Tarrytown to isolate the trouble, even if it's at the other end of the line, and repair is by card replacement. A spare voice-grade line and spare circuit cards are available at the multiplex bay.



Al Shaffhauser of New York Telephone at the test panel of Stelma Telecommunications DataPak equipment at Union Carbide Technical Center, Tarrytown, New York.

Both New York Telephone and Union Carbide expect this to greatly reduce downtime. And because the system is monitored by Union Carbide's staff, the telephone company anticipates lower maintenance costs.

Presently, the Carbide's message network is made up of 200 terminals on 70 teletype-grade channels, with most of the terminals in full-duplex operation. The 75-baud channels each can connect up to 10 terminals.

The overall communications system, called the Message Record System by Union Carbide, is built around dual IBM System/360 central processors. It handles most of the $2-billion corporation's domestic sales orders and administrative traffic, and serves terminals in the United States, Puerto Rico, and Europe.

Connects to Regional Centers

It performs data-collection functions and it connects to the company's two regional data-processing centers, allowing the IBM System/370 Model 165 batch-process computers to send billing, payroll, and inventory messages to field sales offices and warehouses automatically.

The new system will accept messages in Baudot, ASCII, CCITT, and IBM codes, and full- or half-duplex terminals using any of these codes can be connected to it. And it is programmed to send and receive traffic at the rate compatible with the particular facility and terminal addressed for each message.

This is an important feature because, with the code-conversion capability, it allows the system to use not only its own captive Teletype terminals but TWX, dial lines, Data-phone, and CRT terminals as well, and to accept and initiate international traffic.

Union Carbide expects message traffic between the EDP centers and the MRS system.

The Message system does all necessary conversion to handle both five- and eight-level codes and will automatically do code conversion between ASCII, Baudot, CCITT, and IBM. Both five- and eight-level half-duplex selective terminals are connected to the system. Any new terminal equipment added to the system is expected to be eight-level, though the company sees five-level equipment around for years to come.

The flexibility of the DataPak equipment insures that Telco can handle the expected traffic growth and data rate changes with a minimum of costs and engineering time.

Mac used to say, "I need a crystal ball when it comes to sales forecasts." Then one day he discovered he could afford the next best thing.

Those long days and nights of brainstrain and sleeplessness are over at last. Mac has the next best thing to a crystal ball right on his desk. It's a terminal with a direct line to the world's largest time-sharing computers.

"Sure a computer would help," Mac used to say. "But who can afford it?"

United Computing Systems, a subsidiary of United Telecom is making economical computer-power as available as the telephone. A large and varied catalog of programs is solving problems and expanding capabilities for business and professional men all over the nation.

"Who can afford a computer? I can afford as many as I need," Mac says now.

United Computing Systems is one of several non-utility subsidiaries of United Telecom. Also included are United Business Communications and North Electric, a major supplier to the communications industry and the U.S. government. These companies, and others, are accounting for an ever-increasing share of total corporate revenues.

And this is happening even though the utility subsidiaries are growing steadily. United Telephone System, the nation's third largest telephone system, continues to enjoy rapid growth because its service is concentrated in growth areas.

United Telecom is already a 1.7 billion dollar corporation, bigger than many of the most familiar names on the Fortune and Forbes 500 lists.

We don't need a crystal ball to see where we're going. And now Mac doesn't need one either.

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Circle 47 on Reader Service Card

Concentrator Is Key Link in INFONET

One of the key problems facing the development of a true nationwide computer utility has been the development of a reliable, economical communications network. Another key item has been the ability to provide full service—that is, both interactive and batch capabilities on the same system.

Remote-computing services process data in two major modes of operation, interactive and batch. In interactive processing, the subscriber uses a low-speed keyboard terminal, and he communicates directly with the computer. He can change the data or computer instructions as he works out a problem.

Batch processing, on the other hand, uses a high-speed bulk terminal. The computer is instructed to process a job, which it performs at a convenient later time without further control by the operator. The technical requirements of these two modes have limited the computer's effectiveness. Different programming languages, procedures, data files, terminal equipment, and other characteristics of each mode, as well as those of the company providing the remote service, have contributed to the problem.

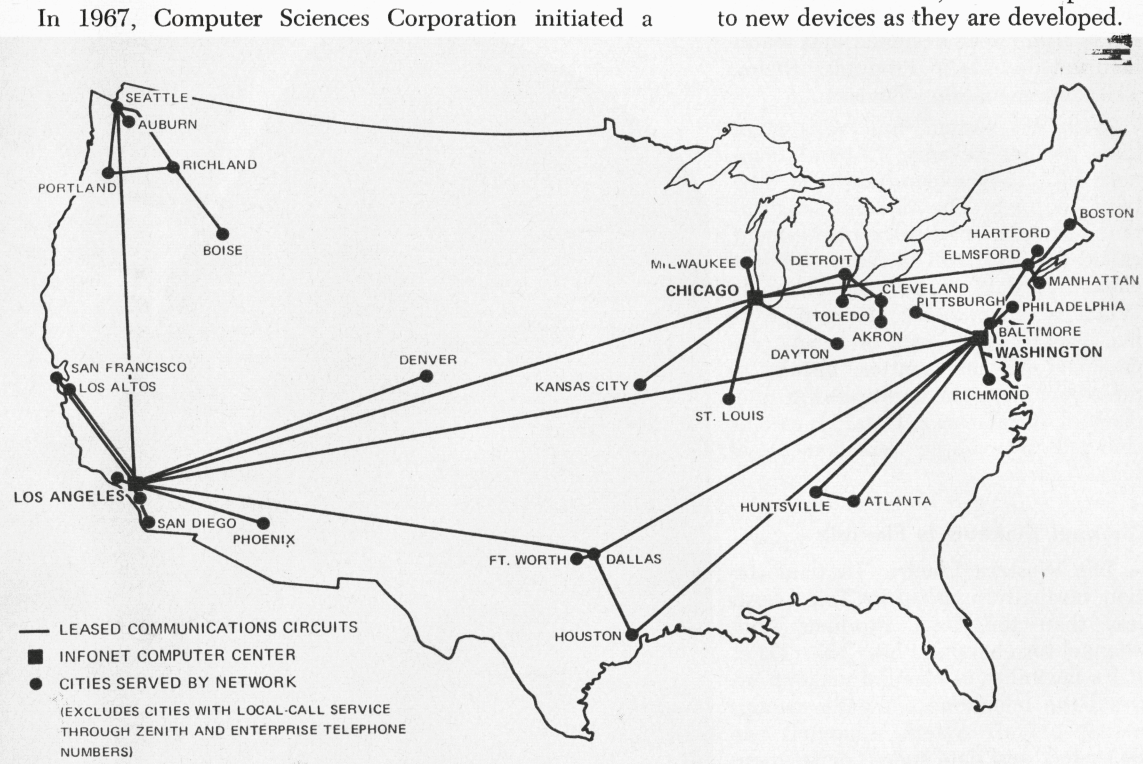
Compounding the situation, computer users frequently subscribe to several services to fulfill their needs, increasing the incompatibility of their programs and data files, multiplying costs, and further fragmenting the overall data-processing effort.

In 1967, Computer Sciences Corporation initiated a study to assess users' requirements for a computing service linked by common-carrier communications to a large, centrally located computer. Conclusions of the study pointed to the need for a comprehensive remote computing service—one that incorporated a nationwide communications network, provided an extensive library of application packages, and offered the user the capacity to construct and maintain a large data base.

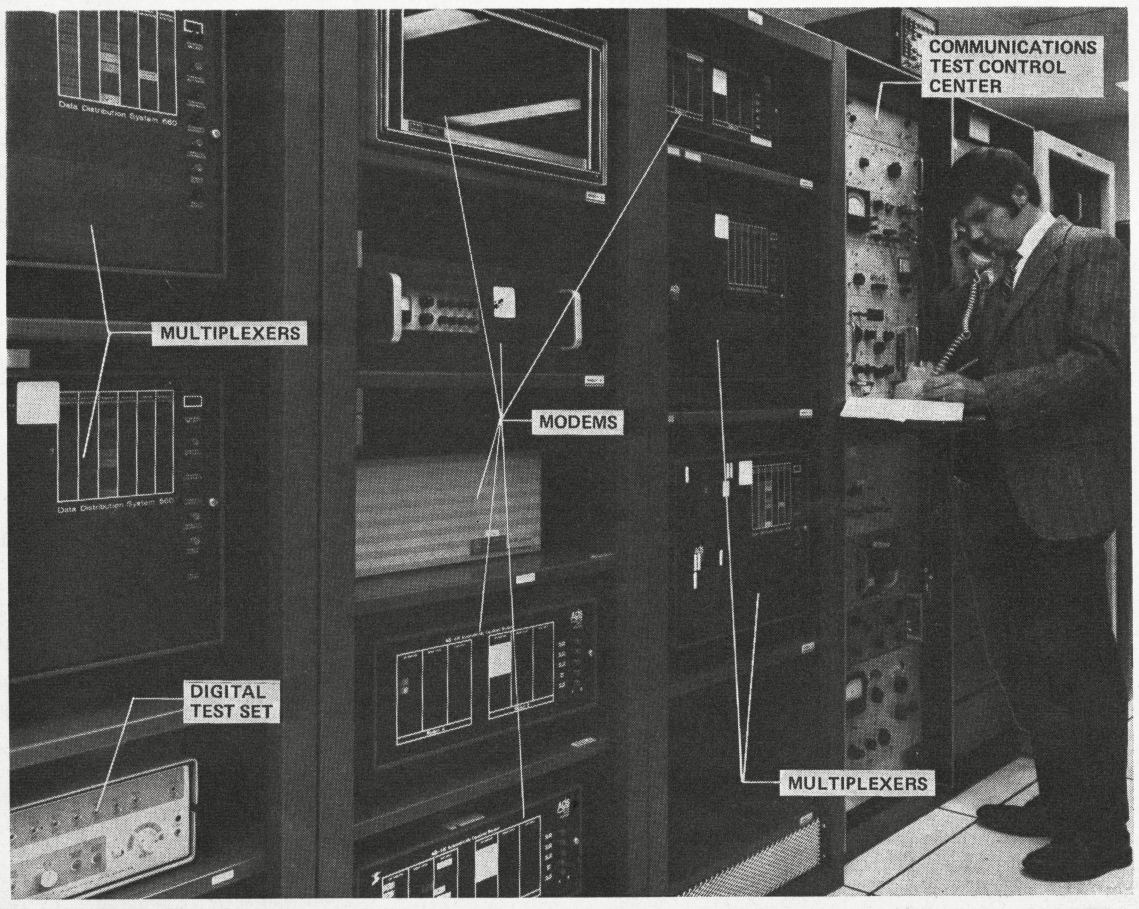
INFONET: A Full-Service System

The result was CSC's INFONET, a remote service in which the entire capability of the network is equally available through both interactive and batch modes of processing. Customers, large and small, can use any program, any language, any programming tool, and any file or data base in either interactive or batch mode. This permits even the smallest user to compete on an equal footing with corporations that have large, elaborate in-house systems. Likewise, it permits large users to expand their in-house capacity on an as-needed basis.

The system accommodates virtually all methods of access, types of terminals, speeds, and commmunication codes in current use, and is adaptable to new devices as they are developed.



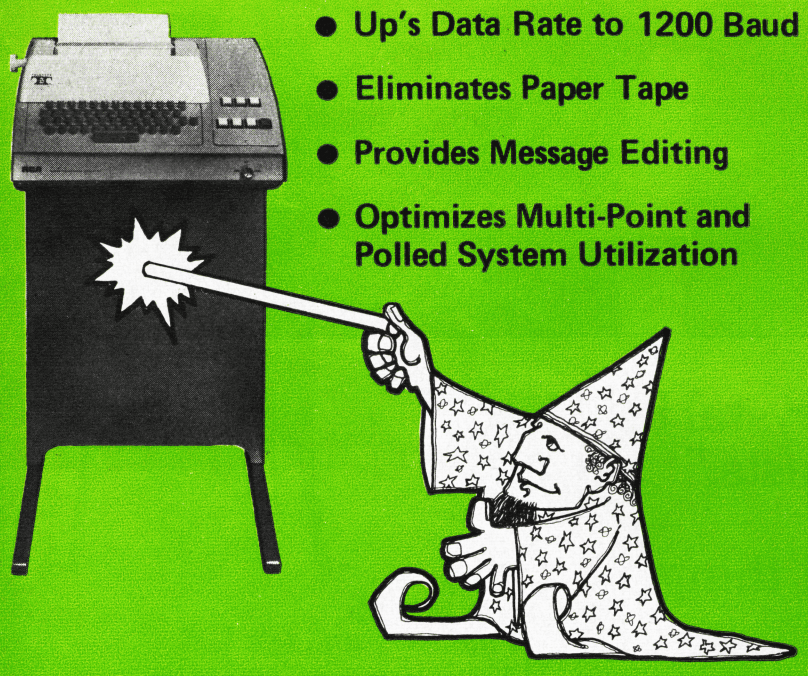
Major cities in INFONET teleprocessing network. INFONET provides nationwide teleprocessing services from large-scale computer centers in metropolitan Washington, D.C., Chicago, and Los Angeles. Leased communications circuits link the centers to 19 INFONET branch offices and to 12 Federal Data Processing Centers operated by the General Services Administration (the system was recently selected by GSA to supply nationwide teleprocessing services for all Federal agencies). All told, some 1,000 customers in more than 100 cities utilize the service from remote terminals in their own offices. Only the major cities and the backbone network are shown. While the number of circuits connecting each remote branch to a computer center is not indicated, each INFONET branch has at least two dedicated diversely routed circuits (to increase overall reliability) connecting the branch location to the central computer site.



Typical communications installation for each INFONET computer center.

A 1200 Baud Terminal?

YES! WITH PULSECOM'S TERMINAL BUFFER.



- Up's Data Rate to 1200 Baud
- Eliminates Paper Tape
- Provides Message Editing
- Optimizes Multi-Point and Polled System Utilization

Pulsecom's Model 7132 Terminal Buffer serves as an interface between low priced teleprinters such as a Teletype® Model 33 or 38 and a high-speed data link.

It provides a 4000 character memory; a 1200 baud rate; a high-speed editing capability — character, line or message; automatic transmission and reception; alarm indications and solid-state reliability.

The standard memory capacity of 4000 characters — equal to one full page — may be increased up to 16,000 characters in increments of 4000.

Contact Pulsecom's Marketing Department for more information about the Models 7132.

®Registered trademark of Teletype Corporation

PULSECOM

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TELEPHONE 703/820-0652 TELEX 89-9423

Circle 48 on Reader Service Card

Subscribers can use a keyboard terminal for interactive or batch processing. For instance, new data can be submitted from a keyboard terminal for batch processing and the results printed on that terminal. Or, alternatively, the results can be printed on a high-speed terminal in the user's office or at an INFONET branch office.

Finally, the system has been designed to manage the massive data files characteristic of large-scale business data processing. The key to INFONET's full service is CSTS (Computer Sciences Teleprocessing System), an operating system developed and owned by Computer Sciences Corporation. It is a fully integrated set of supervisory programs and language processors that permit hundreds of users to operate INFONET at once in either deferred or conversational modes, and in any language (BASIC, FORTRAN, COBOL, and assembly). CSTS also includes a set of file-management routines that permit large data bases to be stored, updated, and manipulated with ease. Files can be freely moved among disks, drums, and magnetic tapes without changing programs or file formats, and can be accessed by all languages.

INFONET currently uses six Univac 1108 computers in the network. The 1108 has a main storage capacity of 10^6 characters, which is augmented by a magnetic-drum subsystem. Immediate access storage is provided by a Multiple Disk Drive (MDD) subsystem. Each disk unit can store more than 36×10^6 characters. Additional storage is provided by eight magnetic-tape drives per 1108 with support for both 7- and 9-track recording formats.

INFONET'S Communications Network

By designing a nationwide system with only three centers and multiple computers per center, INFONET is more dependent upon a reliable communications network than had CSC elected to place a single mainframe in each of numerous centers. Principal motivations for the small number of centers were the higher reliabilities and longer operating hours achievable with such a configuration, greater flexibility, and user access to common files from diverse locations. Efficient utilization of existing common-carrier facilities also renders this a more economical choice.

To help ensure operational reliability, INFONET's network design incorporates extensive fault isolation, on-line performance monitoring, instrumentation, and redundancy. On-line performance monitoring is accomplished through both hardware and software means. The objective is to sense circuit degradation before it becomes sufficiently adverse and affects user terminal performance. Communication hardware used in the network contains complete loopback facilities to permit fault isolation.

To provide highly versatile communications a special concentrator was necessary. This led to the INFONET Remote Communications Concentrator (RCC), a minicomputer built to CSC's needs by the Comten Corporation.

Further flexibility is achieved by the multiple trunk capability of the RCC, which serves two distinct high-speed trunks. This facilitates access to two distinct 1108s from the same RCC, which also is available in cities served by multiplexers. INFONET utilizes one network with common hardware for all communications—both low-speed, asynchronous requirements, and high-speed remote-batch-terminal needs.

There are currently about 25 RCCs in the network. They are the major "building blocks" which provide both the flexibility and the capacity for network expansion.

In addition to providing access for low-speed terminals, the RCC accommodates high-speed data (2000 b/s), remote job entry (RJE) dual access (2000 b/s), high-speed RJE with dedicated lines (up to 4800 b/s), and multiplexer ports. Currently, the network supports all remote terminals (card reader, card punch, and line printer) which are compatible with the 2780 Binary Synchronous Communication (BSC) discipline.

High-speed dial access permits users with their own RJE terminals to access INFONET via a local call and a standard Bell System 201A data set (or equivalent).

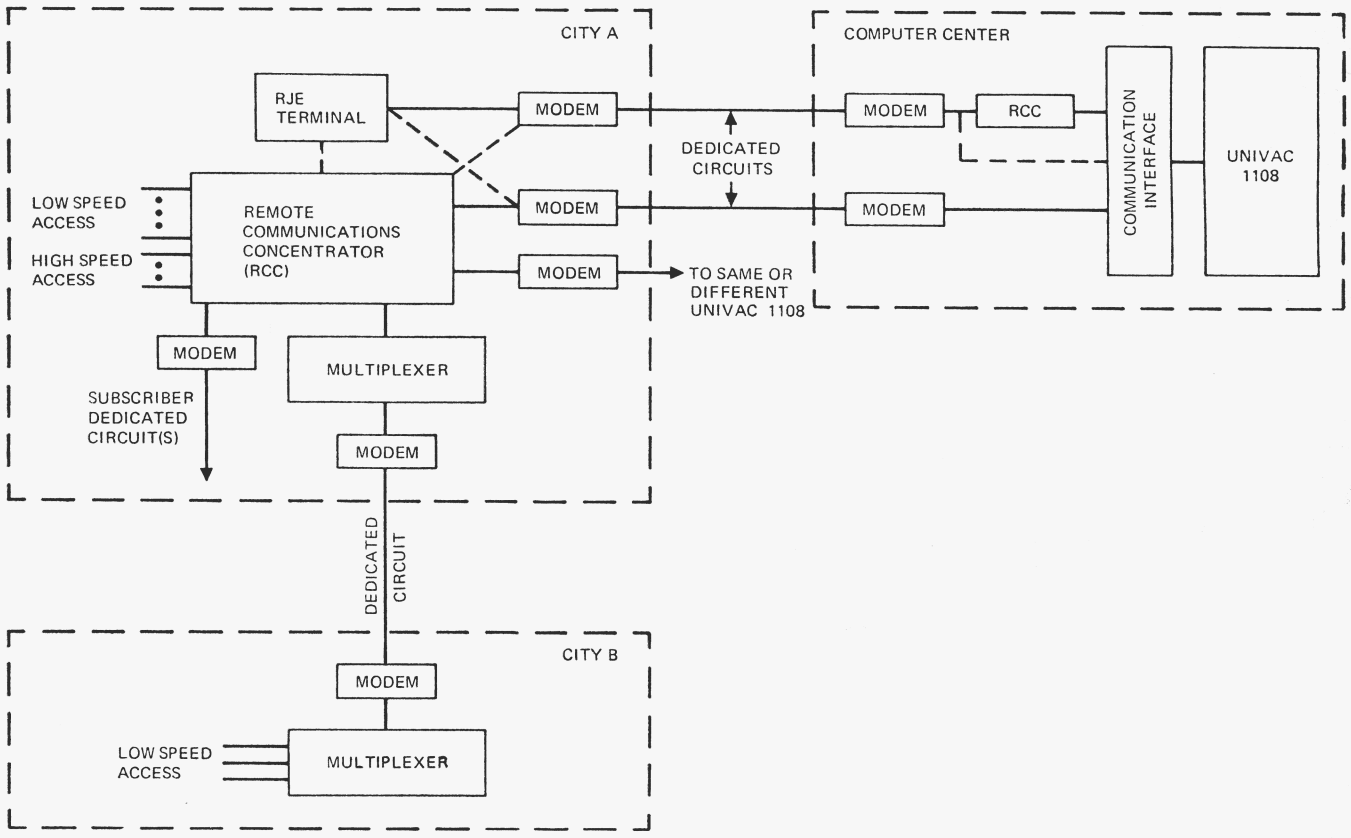
The RCC may also be used as an interface for multiplexer links. Multiplexers are connected to the nearest RCC via a dedicated circuit and synchronous modems. Forward error correction is used on certain multiplexer links to overcome transmission errors.

The primary communication link from the RCC to the 1108 is a Bell System C2 dedicated full-duplex circuit. The transmission rate (modem speed) is selected according to anticipated input load.

INFONET's communications network has been designed to facilitate load balancing. If one central processor becomes heavily loaded, one or more RCCs serving that processor may be shifted to another 1108. User files are transferred on an overnight basis, the communications realigned, and the shift accomplished without disturbing the user.

Prospects for the Future

The evolution of computer-communication networks is progressing at a very rapid rate, and the pressure is constant to expand the network and add new features, such as the trend towards more "intelligent" terminals and concentrators. There is also pressure to introduce network features such as higher speed dial-up, positive error control complete from terminal to computer, higher speed asynchronous terminals, and even provisions for computer-to-computer communications with all the potential for file and load sharing. With the introduction of domestic communication satellites within the next five years, these are expected to play a significant part in shaping data networks.



Computer Science Corporation's INFONET equipment and circuit configuration. Communication hardware contains loopback facilities for isolating faults.

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Circle 49 on Reader Service Card

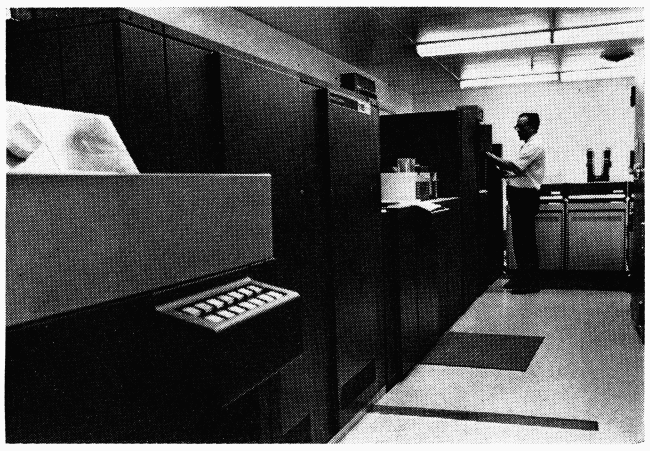
Mastercraft Uses Off-Line Magnetic Data Recording System for Inventory Control

A large supplier of kitchen cabinets, the Denver-based Mastercraft Industries, was started by Cecil Hernandez as a part-time business in his garage. In a dozen years, the firm has become one of the industry leads in the production of kitchen cabinets, manufacturing an average of 1,200 cabinets per day.

The company deals mainly with contractors and large developers on a wholesale basis. Mastercraft's rapid growth has led to manufacturing facilities and sales offices in Phoenix and Dallas as well as Denver.

Ken Sandoval, the company's controller, attributes Mastercraft's growth primarily to two factors. "The most important thing is the good relationship between the employees and the management," he states. "Secondly, Mastercraft has developed a competitive edge by employing some unique assembly methods and machines.

"And, quick processing and delivery of orders, plus accurate control of a complex inventory, has helped us achieve a fantastic growth pattern. Sales climbed 67 percent in one recent year."



The off-line communications network with System 4300 has saved Mastercraft up to 67 percent "connect time". Bill Thornton, data-processing manager, loads a magnetic tape prior to processing inventory transactions.

The salesman's handwritten order is input directly onto computer-compatible magnetic tape, ready for processing.

On-Line System Proves Inefficient

To maintain their fast turnaround, the company needed an accurate, reliable, yet relatively inexpensive data-communications network. With a rapid growth rate and three facilities trying to use the same inventory and accounting systems at a centralized computer facility, the previous on-line data communications system proved unwieldy.

"Previously, we were using an on-line system employing a Data-Phone," says Sandoval. "When one of the plants wanted to transmit, we had to stop the computer and hook up the transmission device. The system was quite expensive and continually tied up our computer. We also experienced a lot of input problems which hindered our inventory control system."

Precise inventory control is essential if the company is to maintain the rapid turnaround time that has helped produce the tremendous growth rate. Ten basic items must be maintained in a perpetual quantity-item inventory.

There are six different styles of kitchen cabinets, for example, and four basic colors.

Off-Line System Solves Problems

Thus Mastercraft wanted an accurate, reliable, and more flexible data-communications network which nevertheless was not expensive. After a careful examination, the company decided to switch to the Singer 4300 magnetic data recording system. This off-line data-communications system freed the firm's overworked computer for essential processing time, besides providing multipurpose terminals which are used as data entry and verifying units when not transmitting or receiving.

Mastercraft's present configuration at the home office in Denver includes a 4311 magnetic data recorder for data entry and transmission, a 4301 magnetic data recorder for data entry, and a high-speed line printer. Both the Phoenix and Dallas plants have installed 4311 terminals and high-speed line printers.

Growth Handled by Computerized Inventory

The salesman measures the kitchen and helps the customer determine how many cabinets are needed, the style, sizes, and color. He enters this information on a form which in effect becomes the invoice. After obtaining the customer's approval, the salesman sends his order to the accounting department, where the invoice is audited and the calculations double-checked. From this order the inventory is updated.

An operator enters the data and the case number through a stand-alone 4300 unit onto computer-compatible magnetic tape. The tape is processed on the computer and the two key items for Mastercraft's inventory control system are produced—a production demand, or inventory report, and a paint card.

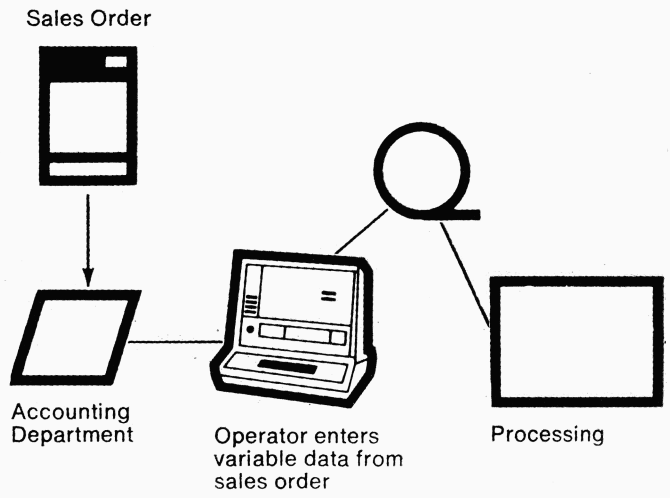


Diagram of Mastercraft's inventory control application with Sir of shipment, and is attached to the cabinet during the assembly ter inventory file.

For the inventory report, the computer has stored data on all of the materials that make up each complete kitchen. Information on each day's sales is fed in and processed, and the printout shows the various styles of doors, drawers, cases, and other stock items needed to meet delivery demands for three days in advance. The stock status report is on the same printout; management can see at a glance if additional material is needed or if material should be ordered from the parts plant.

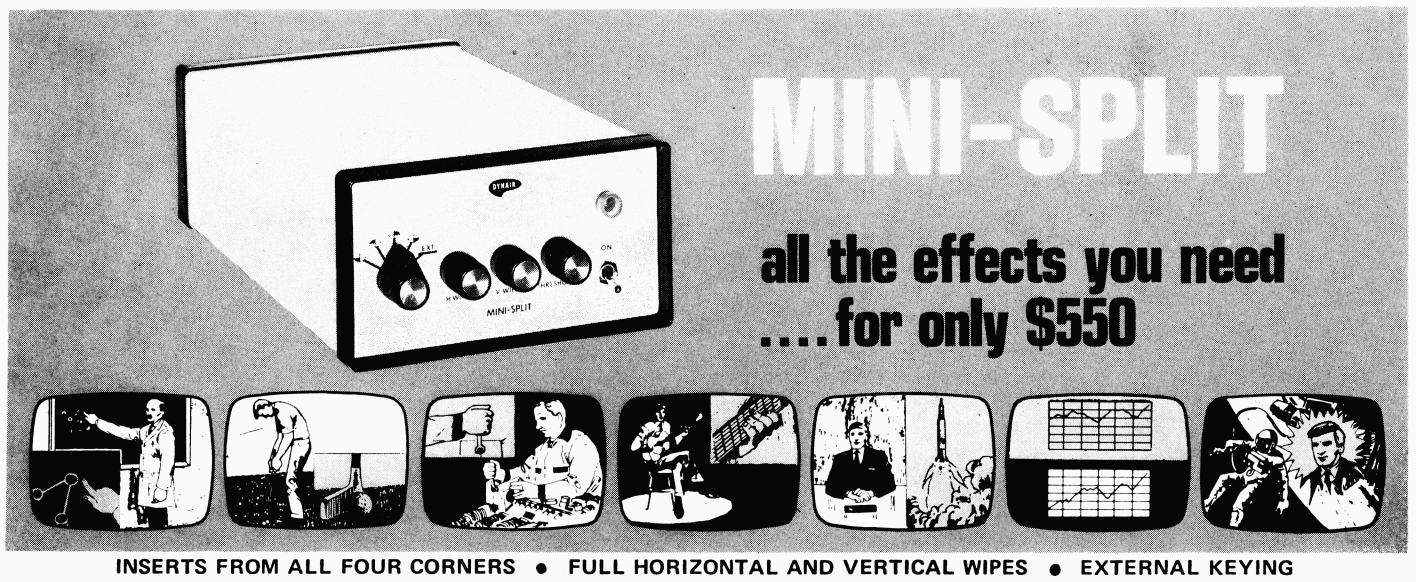
Painting by the Number

Based on information from the computer, a paint card on colored stock is produced on the line printer for each cabinet. The colored stock denotes the color of the cabinet. Each card is perforated and coded for data such as style, size, color, hardware status, and date of shipment. The cards are sent to the production department, which withdraws the needed cabinets from inventory. A card is attached inside each cabinet and remains there through the assembly production process.

When the cabinet reaches the quality-control section, the perforated portion of the card is detached. Data from the perforated portion is entered through a 4300 unit on an hourly basis. This source input to the master file in Denver keeps the inventory records up to date at all times.

The paint-card system works very well. The Phoenix

Mastercraft's controller, Ken Sandoval, discusses inventory printout with Singer's Michael Sheriff.



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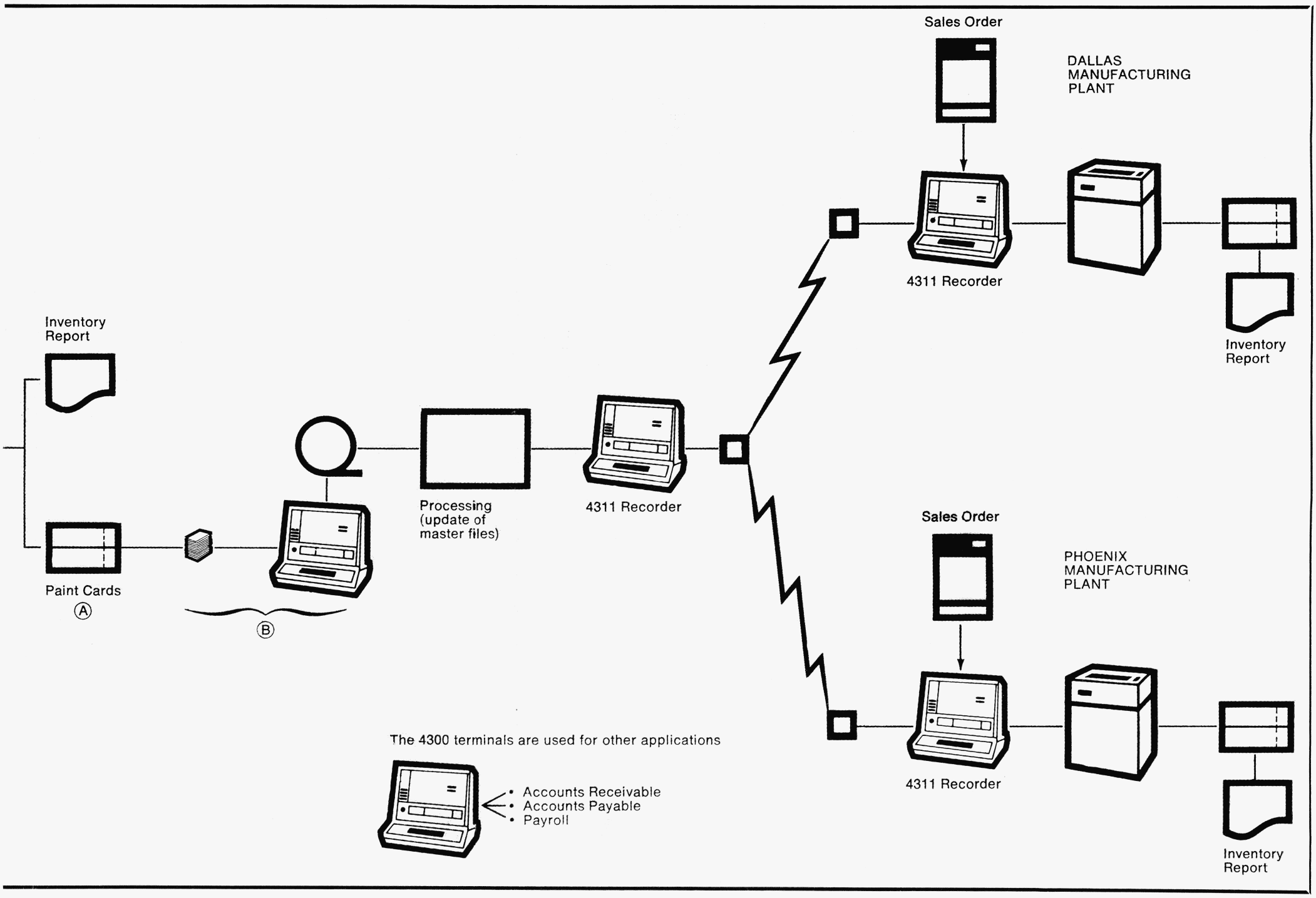
Circle 50 on Reader Service Card



ıger 4300 magnetic data recording system. Notes: (A) A color-keyed paint card is generated for each cabinet. This perforated card is coded with important data such as style, color, and date ' cycle. At the end of the assembly cycle, the stubs are detached from the card and important manufacturing data is entered into the system. This data is the base with which to update the mas-

plant processes data in the same manner, putting the input on tape and transmitting it to the home office. Denver processes the data on the computer and sends it back to Phoenix, where the updated data is output on a high-speed line printer. Paint cards for Phoenix are printed, too!

"It's very easy to use this system with the 4310 terminals," reports Sandoval. "We just call Phoenix when we're ready to transmit. They load their paint-card program: we process their tape, transmit the data to them, and the paint cards are produced on their line printer. We use the same system for the Dallas plant."

The 4300 system also is used for other accounting functions at all locations, including accounts receivable, accounts payable, and payroll. Sandoval is considering the use of a magnetic data central pooler for inventory tracking, with one unit in the warehouse and one in the accounting area.

4300-Measured Results

"We have derived several benefits from switching to the 4300 system," says Sandoval. "Tape input, of course, is much faster. As far as I'm concerned, with what we want to spend there is no faster means of input than mag tape.

"Cost is another important benefit. For example, it used to take Mastercraft an average of 45 minutes on a terminal just to collect the information needed for the payroll, plus the time needed to process the information on the computer. Now the entire payroll is completed in a span of 15 minutes," Sandoval notes. "We realize quite a savings in expensive CPU time alone.

"We have also gained quite a bit in the data-transmission area, adding a fast, reliable data-transmission network with a minimum amount of transmission problems. The absence of problems has alone justified the change to the 4300 system," he adds.

"And, all our plants can share the same computer facility because we now have two-way communications—which saves us a bundle of money."

The color-keyed, coded paint card is the main document used in controlling production and inventory at all three manufacturing facilities.

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GTE Tests "Pictel"

GENERAL TEL President Leslie Warner adjusts an experimental "Pictel" video-telephone set which will be field tested in the near future. Shown inspecting the video telephone with Warner prior to the GTE annual meeting in Lexington, Kentucky are shareowner Mrs. Carol Horgis of Lexington and Otis Campbell, president of General Tel of Kentucky. Visible on the video screen is Mrs. Horgis' sister-in-law, shareowner Mrs. Joan Horgis. The Pictel video screen displays pictures 5½" wide and 5" high. Charts, graphs, and written pages can be transmitted over the Pictel set. The document is simply laid flat on the desk in front of the set to permit an adjustable built-in mirror to reflect the page into the camera's eye.

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CRT Terminal System Helps Speed Price Reporting for Chicago Board of Trade

By E. William Sevetson

Director, Systems and Office Services
Chicago Board of Trade

Activity on the Chicago Board of Trade has never been livelier. In fact, futures contracts for wheat, corn, soybeans, silver, and other commodities last year totaled $88.4 billion, a volume exceeded only by the New York Stock Exchange. Approximately 65 percent of United States commodities contracts are traded on the CBT.

The intense pressures generated by this business—in which 25 percent of the daily traffic frequently bursts within the first half hour of trading—naturally create a need for rapid, accurate price reporting. Today, new CRT terminals help keep CBT tickers up-to-the-minute and provide settlement prices 30 minutes faster for final accounting on some 8.5 million annual contracts.

At Key Locations

GTE Information Systems Videomaster 7700 remote terminals overlook each of CBT's trading pits and others are spotted at key locations throughout the six-story-high exchange floor. Although the 25 terminals aren't the first sign of automation here, they have, in less than a year's time, proved themselves the best reporting device yet.

As late as the mid 1960's, the Board of Trade's reporting techniques were accomplished manually by reporters and transmitters from the price reporting stations called "pulpits", located over each trading pit. At the same time processing was handled by groups of clerks, keyboard operators, and telegraphers located at various work stations. Quotations were relayed directly from the pulpits to a nerve center known as Quotation Central for transmission over the ticker to the public. Additionally, clerks chalkmarked the prices on blackboards along the perimeter of the trading floor for the benefit of the members.

The manual system gave way to Com-Quote in 1969. This system, some three years in the making, employed a pair of high-speed minicomputers which received, edited, formatted, and transmitted commodity quotes in about one second. The mainframes were linked with custom-built input devices through which the operator entered data from a keyboard. Each unit also featured a small strip printer for data verification.

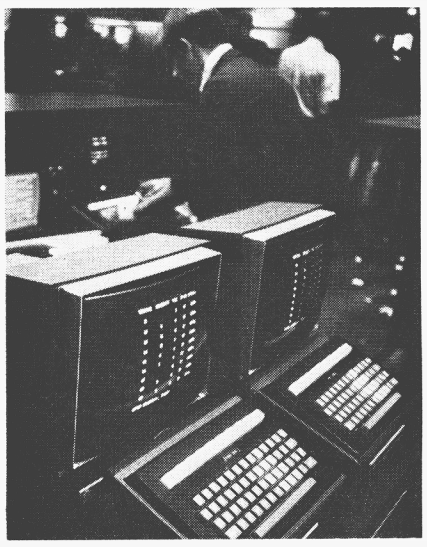
In addition, huge electronic display boards were installed on both ends of the cavernous trading floor as a prime source of current price information for CBT's trading members on the floor. A private cable television network also gave subscribers latest quotes in their offices at the Board of Trade Building. The computers accepted data from the input terminals and then drove the display boards and ticker lines.

But problems soon emerged despite the new-found sophistication. These mainly involved unexpected—and unplanned for—growth. For instance, in 1969 plywood and silver contracts were added, although no new commodities were anticipated for at least several years when Com-Quote was on the drawing board. Result: more contracts were being reported than the system could handle. Soon reporters were phoning price changes in low-volume contracts to the computer room to bypass overtaxed terminals.

By 1970 total capacity had been exceeded by a wide margin. Because of the special nature of the input devices, cost of purchasing additional units was deemed prohibitive. Furthermore, hardware constraints compounded the flexibility problem.

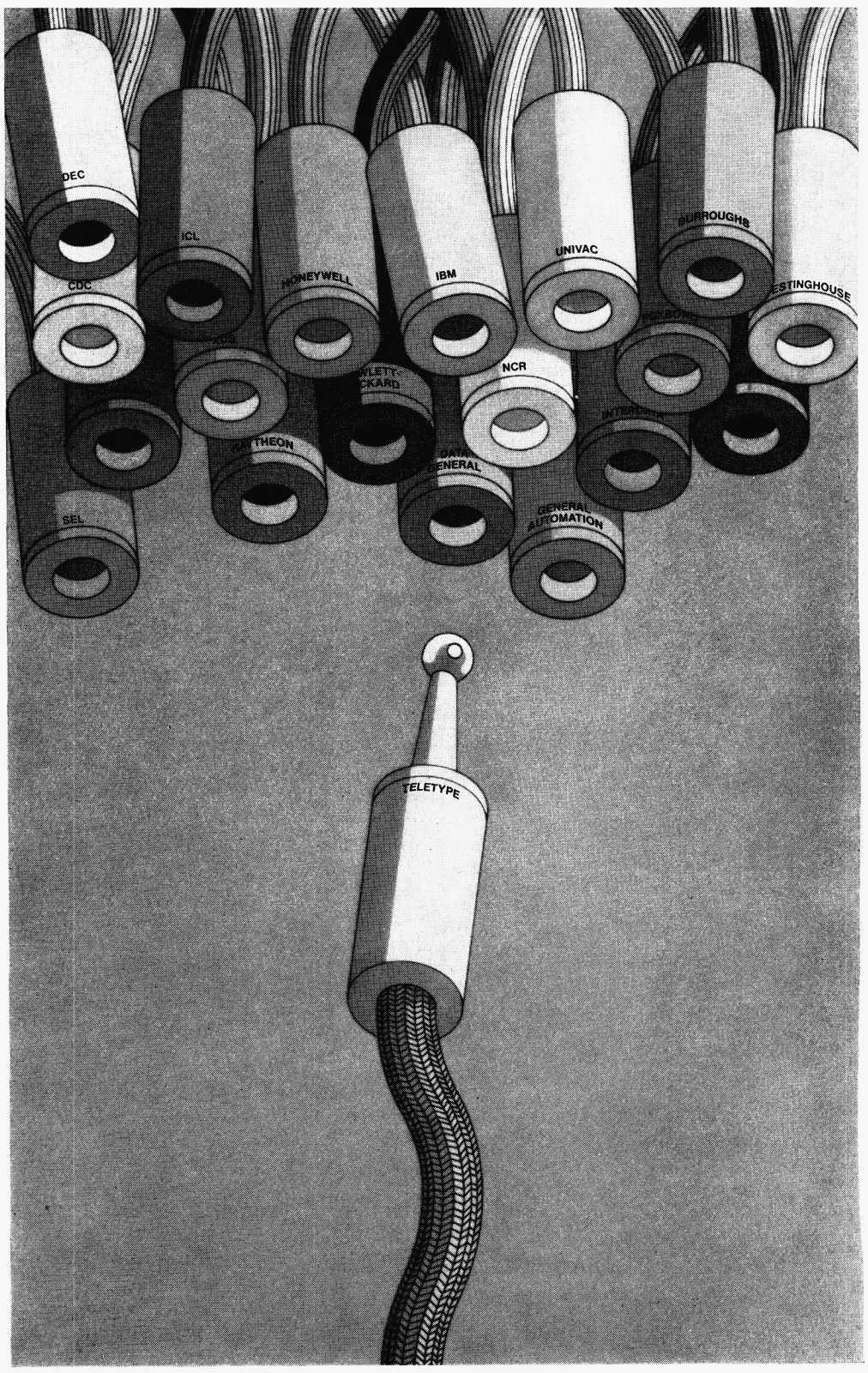
The Com-Quote keyboard was divided into a special three-section format (one with 12-buttons for the months, the second with the digits 0-9, and the third with 16 function keys for entering price changes) which proved difficult to manipulate. Also, the reliability of the thermal, dot-matrix strip printer simply could not meet requirements. A five-character

A GTE Information Systems CRT in one of the seven trading "pulpits" at The Chicago Board of Trade overlooks typical "pit" bidding. Terminals are a highlight of the exchange's new Commodity Price Reporting System which can process up to 160 quotes per minute as compared with 90 to 100 previously.



GTE Information Systems video data terminals located at CBT's control center are used to access quotation information stored in the exchange's System/360 Model 50 computer. One advantage of the new monitors is that they retain the last 12 trades on the screen, thereby improving surveillance and helping to cut errors.

For years, people thought Teletype® machines only talked to themselves.



message had to be entered through the keyboard each time to receive printout. Reading the strips in the pulpits was difficult. Also, most of the system hardware did not conform to electrical and communications industry standards.

Finally, major programming was required simply to rearrange wall-board or TV displays, to drop or add a commodity, or to change trading months. Nonstandard programming proved difficult and experienced programmers were scarce.

For all of these reasons it was decided to upgrade the reporting system by utilizing a new configuration with CRTs as the remote inputs. Its name: the Commodity Price Reporting System (CPRS).

Design was begun in October, 1970. An IBM System/360 Model 50 with a Model 40 as backup served as mainframe for a communications data center operated by Executive Computer Systems, Incorporated, in the suburban town of Oakbrook. The CRTs (two to each pulpit) are linked by three separate voice-grade lines, one each for the major cluster of Videomaster 7700s, a stand-alone Videomaster 7000, and a separate line held in readiness as a backup.

Advantages Are Many

The advantages of the new terminals and CPRS are many. For example, the units are easier to read in the pulpits. Up to 160 quotes can be processed per minute, as compared with 90-100 for Com-Quote. Any CRT can enter a quotation for any contract at any time. Under Com-Quote, each terminal was dedicated to a specific commodity.

Accuracy is improved since the operator can visually verify data on a high-contrast screen *before* transmission. Today, the error rate is 1/10th that of the old system. Also, the new terminals are buffered, whereas data entry with Com-Quote was character-by-character—obliging the operator to start all over again whenever an error was made anyplace in the message.

Visual reference to the last 12 trades is retained on the monitor. This is an important surveillance feature since approximately 90 percent of all errors occur within that range. If an operator spots an error, he simply enters a correction code and identifies the transaction by symbol and time. Then the entry is erased automatically. Furthermore, highs and lows affected by erroneous entries are automatically corrected by the system.

CPRS can process contracts traded as far as two years ahead. Under Com-Quote the limit was 12 months.

Since the CRT employs a standard keyboard, less skill is required to operate the terminal and it is more flexible and easy to use. With Com-Quote every message had to be so many characters long. Now it is variable and free-form.

The old terminals offered a one-way "conversation" with the computer. Now operators can determine from the processor *why* data is being rejected, not just that it is wrong. This speeds error detection.

Still other advantages have helped upgrade the reporting level. One is the use of general polling. Here, the computer polls the terminal controller to determine which CRTs need answering and goes directly to them. This is valuable since most data is associated with certain terminals anyway—such as those in the soybean pit. By contrast, Com-Quote's minicomputers picked up terminal transmissions round-robin, character-by-character, without regard to where business was heaviest. Furthermore, operators frequently keyed in transactions faster than the minicomputers could accept them and messages were rejected. Com-Quote often lost large numbers of quotes during peak periods simply because the processors couldn't handle them on a timely basis.

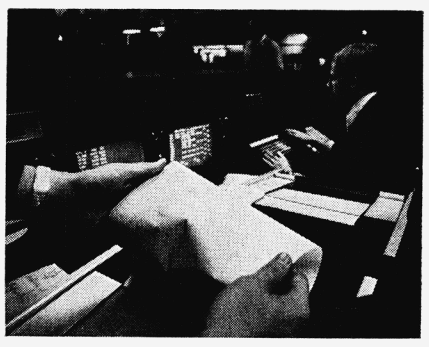
Seven Men Did Software

Applications software for the new system was completed by a seven-man team in one year and operates under IBM's BTAM (Basic Telecommunications Access Method) package. No special programming was required to adapt the GTE-IS terminals to the IBM configuration because of their full compatibility with Systems/360 and 370.

CBT also employs GTE-IS 2400-baud modems. These pass data traffic over dedicated lines between the computer center and the terminals, offering rapid switchover to the dial network in case of line failure. In fact, each hardware component in CPRS is redundant for maximum system reliability.

Com-Quote's electronic quote boards and television network are still very much part of the new setup. But the use of CRTs within a more powerful system clearly is helping the exchange, its members, and customers in day-to-day commodities trading.

Clerk in control center calls up quote on screen of his GTE Information Systems video display terminals. CBT's computers are located in the Chicago suburb of Oakbrook and operate under IBM's BTAM (Basic Telecommunications Access Method) package, exchanging data with the terminals over dedicated lines. No special programming was required to adapt the GTE-IS units to the IBM configuration because of their compatibility with Systems/360 and 370.



GTE Information Systems thermal printers are linked to company's CRTs in the control center on the exchange floor. Units offer quiet operation at a fast 30 characters per second, printing data displayed on the screens or contained in the computer's memory.

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Our model 37 series handles all the requirements of complex data systems. It offers the utmost in flexibility and vocabulary at 150 wpm. In addition to the ASCII characters, you can add up to 32 special characters of your own.

For paper tape systems, we've got equipment with capabilities to send and receive up to 2400 wpm.

Our 4210 magnetic tape terminal—which interfaces with all our eight-level terminals—offers easy data handling and storage, at an on-line speed of 2400 wpm.

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Circle 52 on Reader Service Card

Largest credit communications network in retailing industry!

Bonwit Teller Installs Credit and Check-Cashing System in 10 Stores

A contract to install an on-line CREDIT-CHEK credit authorization and check cashing system in 10 Bonwit Teller stores in New York, New Jersey, Pennsylvania, Illinois, and Michigan was recently awarded to Credit Systems, Incorporated. The award follows successful operation of a pilot system in Bonwit Teller's Fifth Avenue Store in New York City.

The Bonwit Teller system is believed to be the largest credit communications network in the retailing industry connecting via data telephone lines stores in the Chicago, Detroit, and Philadelphia areas, with the central processor unit in New York City.

Bonwit Teller stores in Boston, Palm Beach, and Los Angeles will not be included in the system, at the present time, because of prohibitive communications costs, according to Harvey Grey, Director of Systems.

The Bonwit Teller system includes a number of unique features tailored to the clientele, credit policies, and management reporting requirements of the specialty department store organization.

Among the system features are the ability to distinguish between original issue and replacement credit cards to prevent use of lost or stolen cards without inconvenience to bona-fide Bonwit Teller customers, and the ability to spot the possible passing of bad checks even though there is no record of the suspect check in the system's file. Where a referral call by the sales clerk is necessary, directions are given by the system on which department to call, eliminating unnecessary calls and delays in making credit decisions. In certain situations, the system, without credit-department referral, will allow a transaction to proceed even though the customer has exceeded his or her credit limit.

CPU Is Heart of System

The heart of the Bonwit Teller system is a high-speed Credit Systems central processor unit, with a complete read/write magnetic-tape subsystem and an extensive disk file storage capacity. The CPU is located in Bonwit Teller's Fifth Avenue store.

Negative and restricted accounts are stored in the fast-access disk file in the CPU. Good accounts are also stored in the file if the account is being used. If the account is not being used, the record drops from the file until a transaction is made. The file includes a number of information fields on each account including account number, status code, issue level, and credit limit.

The Credit Systems Model 1400 central processor unit, a general-purpose credit authorizer processor, communicates to authorizer units and counter units and interfaces to various peripheral devices such as a magnetic-tape unit and printer.

The CPU employs read-only memories (ROMs) to provide the flexibility to tailor the system to meet each customer's specific requirements. Its disk drive bulk memory provides a relatively large storage capacity at low cost (one to four disk drives, each with a capacity of 5.75 million characters).

Each account record may have up to 35 characters including the account number and may have up to eight individual data fields. Up to 192 program steps can be accommodated in the CPU. The instruction set contains powerful, multiple address instructions for manipulating credit-oriented data.

The CPU receives and transmits information to terminals at the rate of 300 characters per second. The program is contained in easily removable integrated logic circuits mounted on plug-in circuit modules. The memory is a high-speed head-positioning-type disk drive with changeable disk pack which rotates at 1500 rpm.

The entire central processor including the disk drive and magnetic tape transport is housed in a single cabinet 80½ inches high by 23¼ inches wide by 33 inches deep. All operating controls are front-panel mounted with critical functions under removable key lock control.

Bulk input loading is accomplished via a magnetic tape reader which accepts a wide range of standard IBM-compatible tape formats on seven or nine channels. Tape loading can be done on-line, when the system is answering terminal units, or off-line.

The magnetic-tape unit of the Model 1400 can also function in the write mode to generate a variety of audit trail information. Information which can be recorded includes account number, issue level, status code, amount of sale, credit limit, terminal unit address, and time of day.

Audit trail data is recorded as it occurs. The disk dump is accomplished off-line and takes place at the rate of approximately 300,000 accounts per hour.

Over 400 Terminals and Display Units

Over 400 keyboard/imprinting counter terminals and authorizer display units are included in the Bonwit Teller communications network. The 10-store system includes Bonwit Teller stores in New York City; Short Hills, New Jersey; Westchester and Manhasset, New York; Bala Cynwyd, Jenkintown, and Wynnewood, Pennsylvania; Chicago and Oak Brook, Illinois; and Troy, Michigan.

Keyboard/imprinter terminals are on-line to the CPU during working hours in all 10 stores in the system. When the clerk keys in the numerical data from the credit card, the CPU conducts a number of operations including check digit verification, format and illegal character verification, a search of negative and restricted accounts, entry of new customer files, updating of customer files, determining whether the credit card is an original issue or reissue, automatically upping the credit limits of certain accounts, keeping a transaction record by customer, recording the location of the terminal making the inquiry, the time the inquiry was made, and so on.

A response either authorizing credit and releasing the imprinter on the terminal or refusing credit and indicating which department to call for referral takes place in a matter of seconds. The information recorded by the central file is also used for reports to management to monitor traffic patterns and credit operations.

Keyboard/imprinter counter terminals in the system electronically access the central file via data telephone lines. Authorizer units, used by credit and collections personnel to evaluate the contents of the customer file upon receipt of a referral call, are located in Philadelphia and Chicago as well as New York to reduce the cost of voice calls from counter locations.

Accommodates Standard Cards

The Bonwit Teller system uses Credit Systems Model 225 counter terminals which can accommodate any standard credit card and retail sales slip. The clerk keys in the account number and any other numerical data required. The account status is indicated by one of several light responses. If the transaction is approved, the unit will imprint the sales slip. If no approval response is received, the imprinter will not operate.

Credit Systems Model 3020 Authorizer Units are used by credit and collections department personnel to access the CPU file to review the status of the account, credit limit, account balance, transaction volume since last updating and other information. The console allows authorized personnel to override the system for a single purchase and to insert or delete files. All authorizer insertions or delections are audited by the system for review.

Daily Management Report

One noncredit application of the new system is a daily management report of each transaction processed by the system by department and time of day. This provides invaluable traffic pattern information.

Another report provided by the system is a magnetic-tape audit of each credit and collections department referral and the action taken. A printout of the tape gives supervisors a greatly improved employee monitoring capability.

No Customer Complaints

Possible inconvenience to customers, especially VIP customers, was one of the major concerns in the design of the

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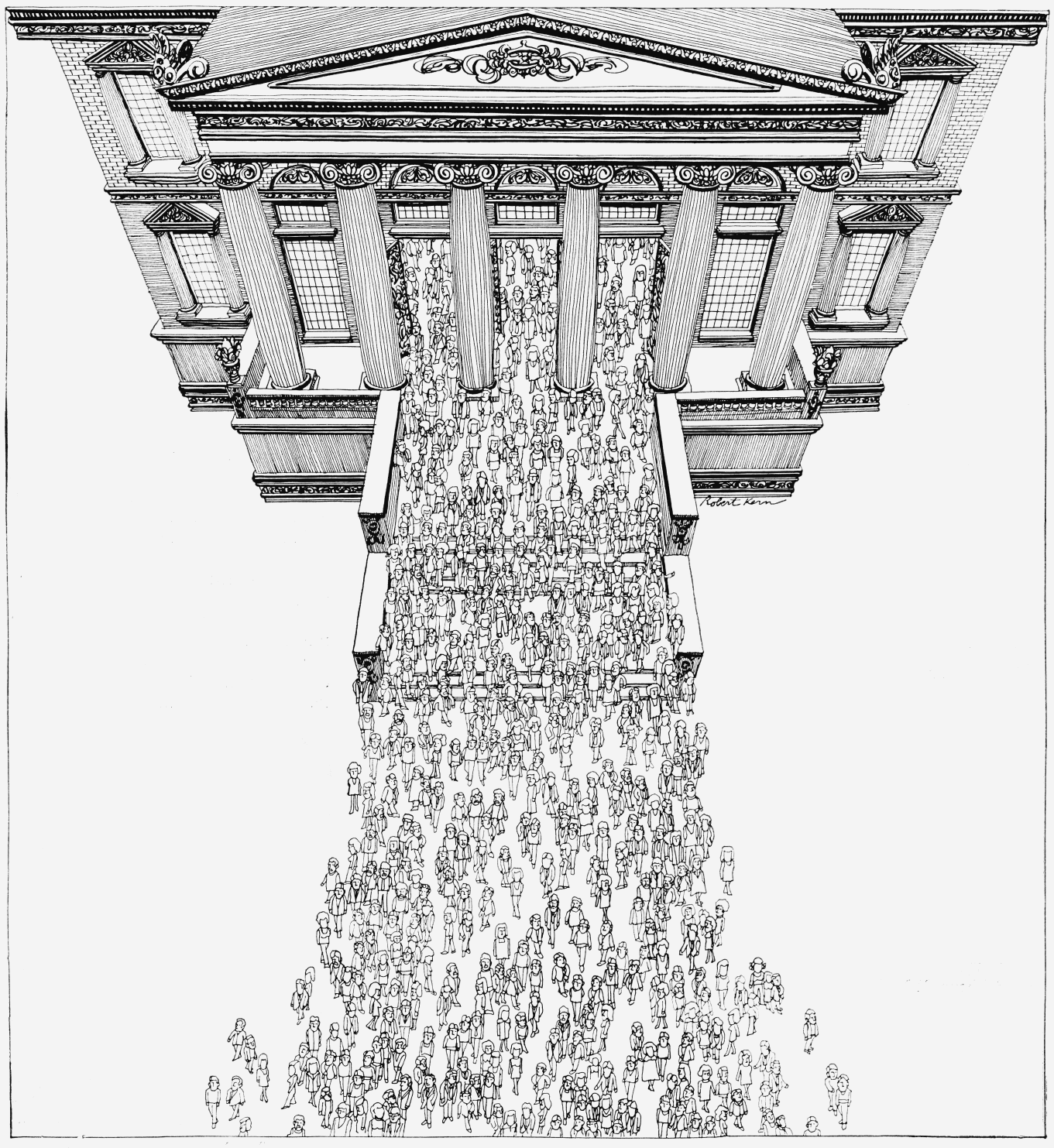


system. This necessitated an investment in the pilot system to carefully check out all of the features built into the system and to gauge customer and employee reaction.

The system greatly reduces the inconvenience to the customer while maximizing credit control. The customer hands the credit card to the clerk and most of the time the sales slip is imprinted in a matter of seconds. Where a referral call is required, the clerk is "told" by the system which department to call so that action is taken with a minimum of delay.

"We found that the system enabled our salespeople to retrieve credit status so quickly that the customer doesn't realize his or her credit is being checked," says Harvey Grey, director of systems, Bonwit Teller. "There have been no customer complaints at all."

Operation Is Simple

The operation of the keyboard/imprinter terminal is extremely simple and requires no knowledge of data processing. The clerk pushes the CLEAR button and a blue light indicates the system is ready to receive. The clerk keys in the numerical data from the card (which includes an issue level and account number) and the amount of purchase, and then presses the SEND button.

A green-light response indicates good credit and releases the imprinter. The clerk inserts the sales check and credit card and pushes in the tray. The sales check is imprinted and the tray is released, readying the unit for the next transaction.

If both white and amber lights are activated, an invalid entry is signified, possibly due to a keying error, and the clerk rekeys the information.

A white light alone indicates a restricted credit response and the clerk calls the credit department for further instructions.

An amber light alone indicates a bad credit response and the clerk calls the collection department for further instructions.

When a check cashing transaction takes place, the clerk follows the same procedure keying in the MICR bank account numbers from the check and waits for the appropriate light signal. The imprinter is not used.

Employees Are Enthused

Reaction from employees, especially those in the "back room," has been very enthusiastic, Grey added. He estimated that the system will eliminate some 1500 phone calls a day for credit information in the Fifth Avenue store alone.

A number of "decisions" have already been made by the system which preclude the need for the clerk to call the credit department. For example, the issue level keyed by the clerk indicates the type of account. Even if the amount of purchase exceeds the credit limit, for certain types of account system automatically raises the credit limit and allows the sale.

Similarly, if the number of transactions during a specified period exceeds the limit set by the store, the system will override these instructions for certain types of accounts.

Management Viewpoint

The reduction in losses from theft or misuse of credit cards or the passing of bad checks is achieved without inconvenience to clientele, especially the type of VIP customer which shops in Bonwit Teller stores.

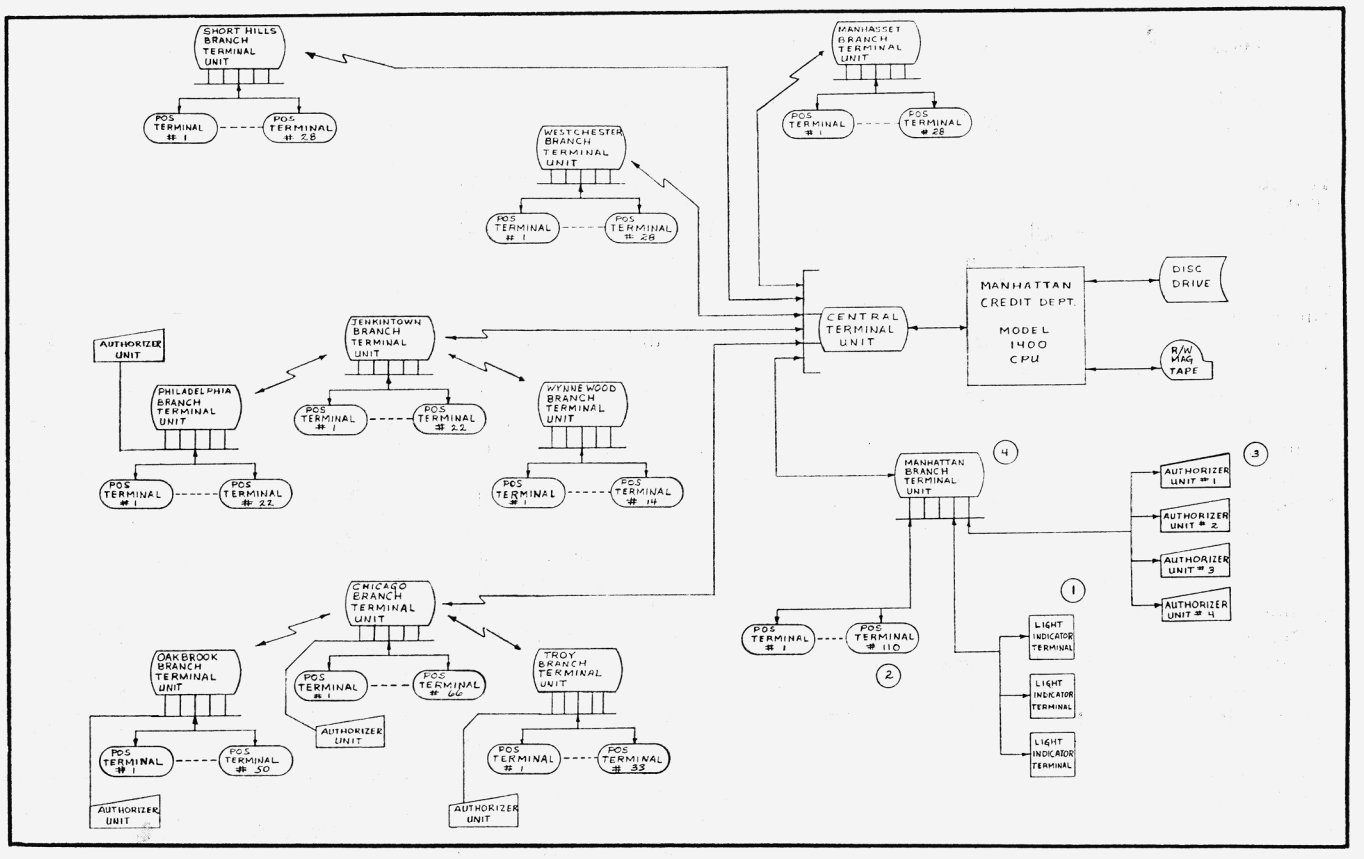
The time formerly spent by salesclerks verifying credit information is greatly reduced and credit decisions are left to the system or the credit department.

The number of credit department personnel required for credit decisions and the time spent by them accessing customer files is greatly reduced, along with the number of calls from the sales floor for credit information.

Updating of files can be done on-line or off-line from magnetic tape data supplied by the receivables department. Authorizer units can also be used to immediately insert new files.

The system provides accurate reports of traffic by store, department, counter, and time of day as frequently as required. All decisions by credit personnel are audited by the system and can be reviewed by supervisors as often as desired.

Circle 53 on Reader Service Card



Bonwit Teller credit-authorization system. Notes: (1) Model 125 light-indicator terminal; (2) Model 225 imprinter; (3) Model 3020 dual display; (4) Model 2005 branch terminal unit.

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Facsimile Plays Vital Role in Radiation Therapy Treatment

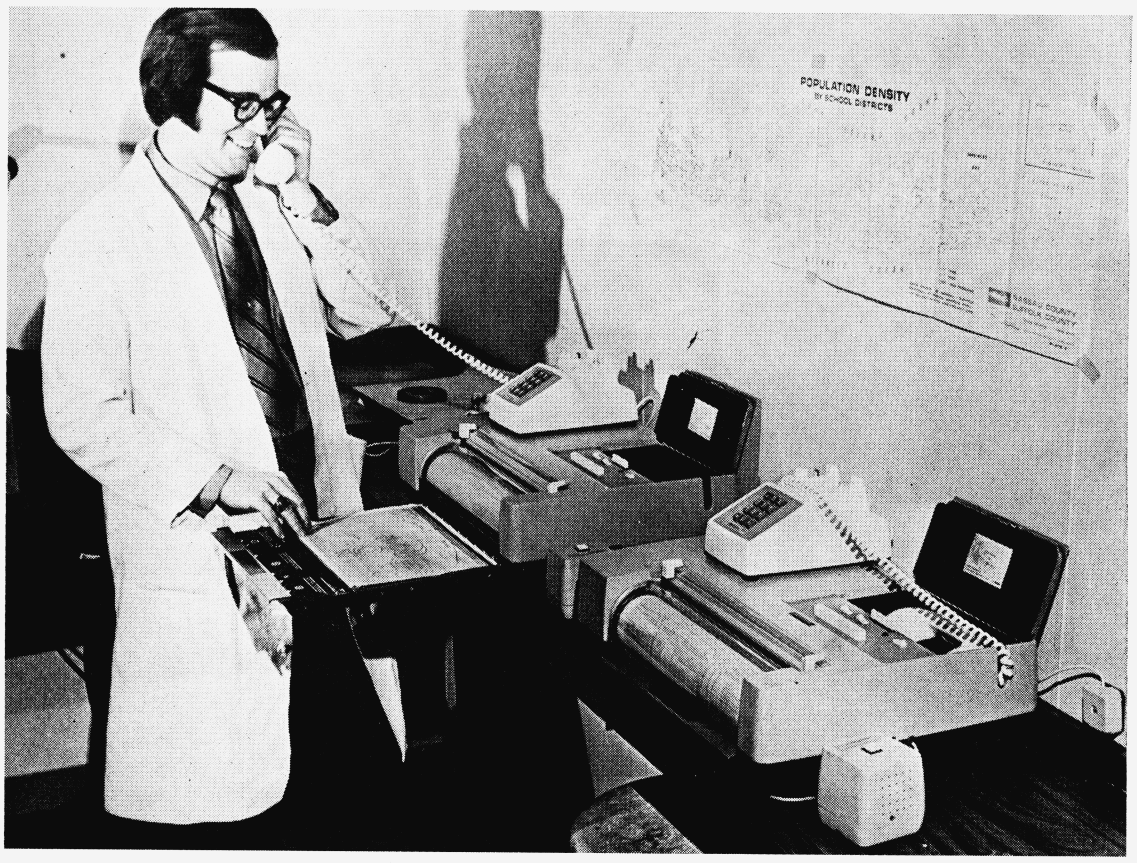
The recent development and advent of the regional medical program system has made it economically possible for small community hospitals in remote or rural areas to provide their cancer patients with sophisticated radiation therapy treatment. However, even within these cooperative systems, curative or palliative treatments are often delayed because of the time required to send patient records and treatment plans between the participating hospitals. To overcome these delays and to insure prompt patient treatment, many regional medical programs are turning with increasing frequency to facsimile communications.

One such program is the Nassau-Suffolk Regional Medical Program which serves Nassau and Suffolk counties in Long Island, New York. This federally funded program operates a Computerized Radiation Therapy Treatment Planning Service for hospitals in the two-county area. The planning service utilizes a facsimile network to connect participating members and to speed up the radiation therapy and treatment process. The facsimile units used are dex I transceivers which are manufactured by Graphic Sciences.

Radiation Therapy Process

While surgery and chemotherapy are ways to control cancer, it is estimated that approximately half of all cancer patients will require radiation treatment as a controlling method. Basically, radiation is used in cancer treatment to destroy or retard the growth of cancer cells or tissues. In applying the radiation, the radiation therapist follows a treatment plan detailing dose strength, radiation beam angles, and other beam characteristics.

The treatment plan which involves intricate, complicated mathematical computations is generated by radiation physicists with the assistance of a computer. Patient history and other medical records are sent to the physicists along with detailed descriptions of the cancerous growth or tumor. This information in turn is programmed into a computer and an optimum treatment plan is generated. The plan is then sent to the radiologist and treatment is begun.



The Nassau-Suffolk Regional Medical Program uses Graphic Sciences' dex I transceivers to transmit radiation-therapy treatment plans.

With a conventional communications system such as mail, this process may have taken days. To speed up the turnaround time and to eliminate the delays inherent in conventional communications, the Nassau-Suffolk Regional Medical Program has installed and is successfully using a facsimile communications system.

Facsimile Communications System

There are 11 hospitals participating in the computerized radiation therapy treatment planning project and each has a dex I transceiver which links it to a central computer network. The computer is located at Nassau Hospital and, along with the dex I system, is used by cooperating members for the fast development of radiation treatment plans. When requesting a treatment plan, a hospital will phone Nassau Hospital's radiation therapy department. The patient's records, a description of the tumor or growth and its location, and other pertinent information such as diagrams are then sent to Nassau Hospital through the telephone line via the facsimile transceiver.

Within minutes, this information is received by personnel at the hospital and is then taken to the computer processing department. The data is keypunched onto IBM cards which are fed into the hospital's computer or sent by messenger to a larger computer center. After this information and other measurements are processed into the computer, the radiation physicist builds treatment-plan models and obtains different radiation isodose curves by introducing various radiation energy levels, strengths, and beam angles into the models.

From these different models, an optimum radiation-therapy plan is then selected, checked, and verified by the radiation physicist. The plan and related computations, pictures, and diagrams are then returned to the requesting hospital via the dex I. With its facsimile system, the total "turnaround" time experienced is considerably less than 24 hours. This means that a patient's treatment plan is ready for the patient's visit the next day.

Program and Patient Benefits

The computerized treatment-planning service was designed to alleviate a treatment-plan availability problem created by the fact that there are only two hospitals in the Nassau-Suffolk area with full-time radiation physicists to compute such plans. While the service does make these plans readily available, this solved only one part of the problem. Once a treatment plan has been developed it is of little value to a patient until it can be used, and the sooner it can be used, the more valuable it becomes. Thus, the program's facsimile system, by speeding up the computerized treatment-plan process, permits these treatment plans to be applied quickly and this timeliness increases the value of the entire program.

The patient, therefore, is the greatest beneficiary of the program's dex facsimile network. Through the speed of facsimile, curative or palliative treatments are begun almost immediately and this immediacy may increase the probability of patient recovery or at least may bring early comfort through the alleviation of pain.

Due to the initial success of this computerized radiation-therapy treatment service, most radiation-therapy installations in the Long Island area are expected to become active, participating members in the program so that their patients, too, may realize the benefits the service offers. The project has made and will continue to make a significant contribution to increased cooperation and improved quality of service within the health-care system of Nassau and Suffolk counties. Facsimile communications has played and will play a vital role in this contribution.

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Testing and Repairing Digital Data Modules in the Field

By George H. Peters

Application Engineer
Data Test Corporation

Even though most electronic equipment is no longer situated in three or four areas in the country, testing and repairing of digital modules in the field is possible and is being done today.

Data communications has been responsible for establishing electronic equipment in the form of terminals in virtually every community and industry in the nation. This wide dispersion of data-communication equipment has increased the problems of maintaining the remote terminal. Downtime is costly to the customer and the equipment is complex. Testing the quality of the data line, taking the equipment off line, or replacing the terminal are no longer satisfactory solutions. Swapping digital logic boards is undesirable because of the large quantity of boards required. Following are two typical cases involving data terminals and the solutions to this testing problem that were chosen.

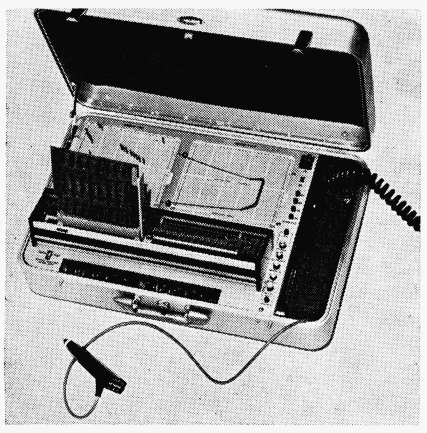
Point-of-Sale Maintenance

Electronic point-of-sale systems are being installed in retail stores across the country. As central information gathering units designed to operate via data communications with a computer, electronic registers can handle inventory control, credit verification, and check for errors. Most important, they speed up customer checkout. The penalty for a down cash register is obviously great and generally cannot be tolerated. Field-service people therefore wisely diagnose the problem to the board level, exchange the board, and disappear from the scene. The suggested bad board or boards are then returned to the factory for repair. Typically, 40 to 60 percent of the boards returned are good. This greatly increases the load, both on testing and in the number of boards required. Thus, the problem with this field-service solution lies in the number of boards required to support any point-of-sale system. The number of boards contained in spare-parts kits, field-service inventories, and in transit can be a major cost item in supporting many systems.

One solution to this costly service problem is to locate testers, and rework the boards, as close as possible to the point of failure. This has the two-fold benefit of little or no paper work and a minimum of inventory. While some managers may claim that their field engineers are too expensive to be trouble shooting and repairing boards, the savings in reduced inventory can quickly show that this can be a worthwhile effort.

Electronic point-of-sale systems may consist of an entire processor, memory, and data-forwarding board in each unit. The central computer may contain additional digital boards.

Until recently, this solution could not be, or did not need to be, utilized for two very good reasons. One, there were not enough systems in the field to justify field testing; and two, no field-support system was available for such universal testing. Today there are more than enough systems in the field, and testers are available. Portable testers can be adapted to functionally test 80 to 90 percent of the digital boards in the field today. Contained in a suitcase, testing can be done on-site by a field engineer. Go/No-Go testing and trouble shooting are both accomplished with the tester, and a typical diagnostic time of 8 to 10 minutes is readily achieved. Point-of-sale manufacturers and users are finding this tester to be a good low-cost solution to their system-maintenance problem.



Data Test Corporation's Model 2000 portable circuit analyzer tests digital modules in the field.

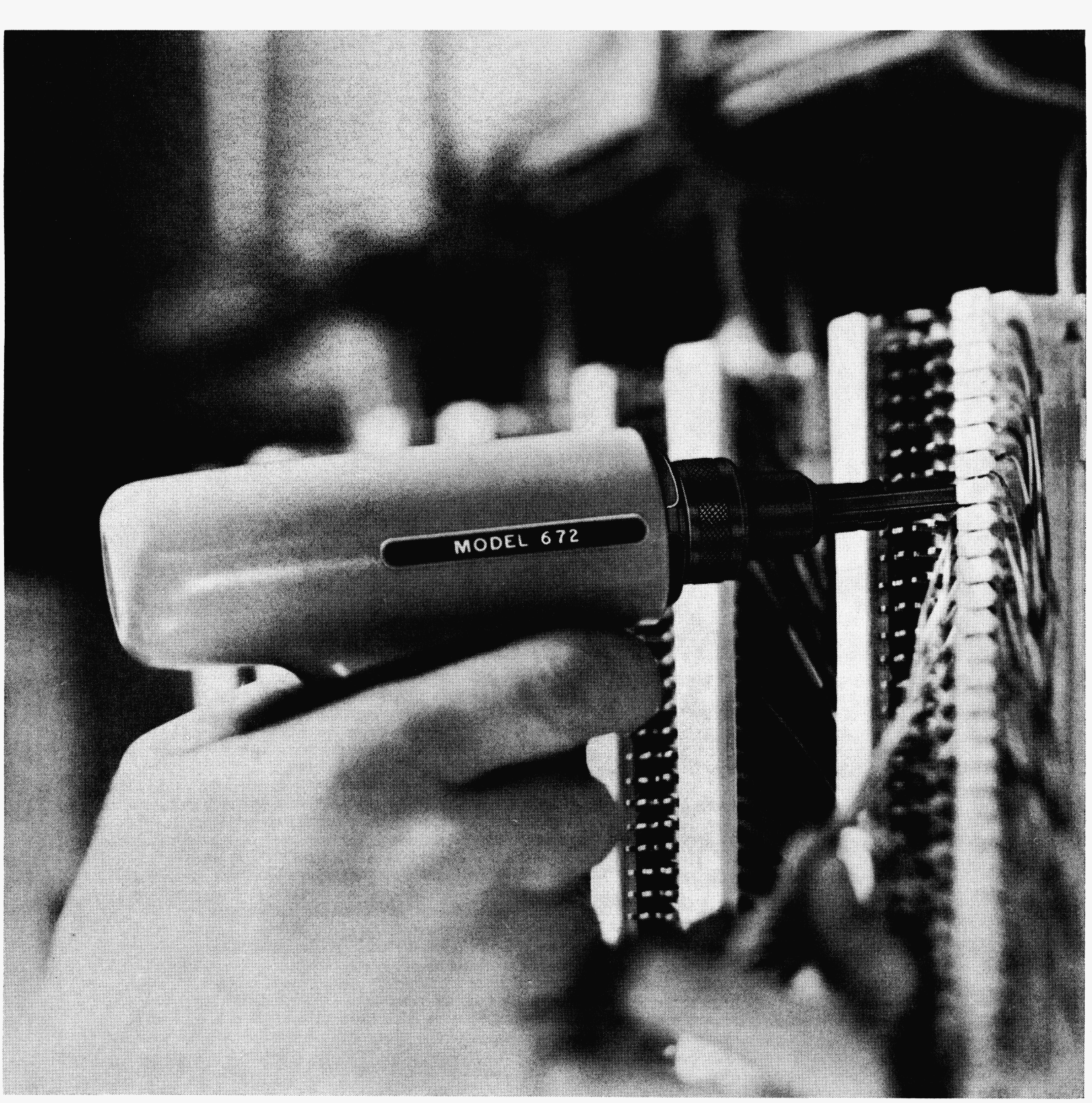
Remote Terminals

A second example of the same type of revolutionary testing requirement is the remote-terminal field. Terminals are to be found in every corner of our country today, and many more are being installed. These terminals typically consist of an interface, a buffer, and a forwarding section. Many interface with even more sophisticated digital equipment, which makes the maintenance problem even more perplexing. Location may be as remote as a mountain top or the far end of a manufacturing plant. In either case, replacing a module can quickly become a logistics problem as 10 to 15 different boards may be involved.

The testing problems for such remote-terminal sites are being solved by installing local bench-top testing at the site. This solution is most practical if the program can be an exact duplicate of the test program used in the manufacturing process. Large facilities can easily justify such a testing scheme to diagnose problems to the IC chip level, even by personnel unfamiliar with the actual operation of the board itself.

The need for portable field testers and inexpensive bench-top testers is real. Maintaining terminals by means of board swapping is not practical because every system and set of modules or PC boards used to support maintainability represents one more system that cannot be shipped. Field-service spares do not contribute to receivables.

Data communications has truly revolutionized the electronics industry, bringing more and more sophisticated data collection and processing equipment closer to the data source. This revolution has in turn changed the thinking of field-engineering people throughout the industry. Testing in the field can be done, and is being done today.



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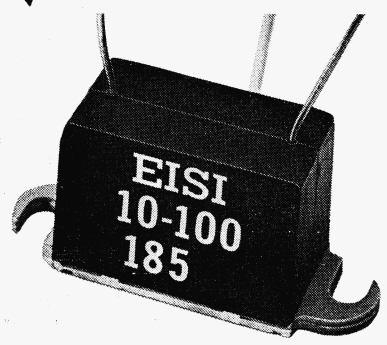

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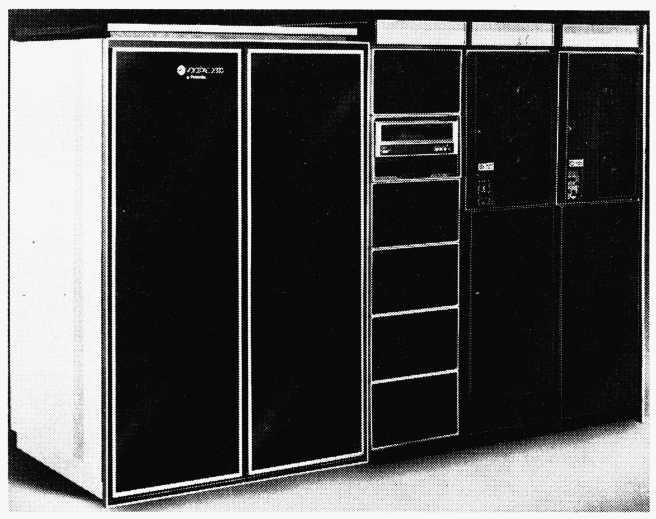
New Equipment for Users of Data-Communications Systems

THE VERY LATEST in data-communications equipment, some of which will be exhibited at the Fall Joint Computer Conference in Anaheim, is shown on pages 58 through 65. To receive additional information, simply write in the appropriate number on the handy Reader Service Coupon on page 69.

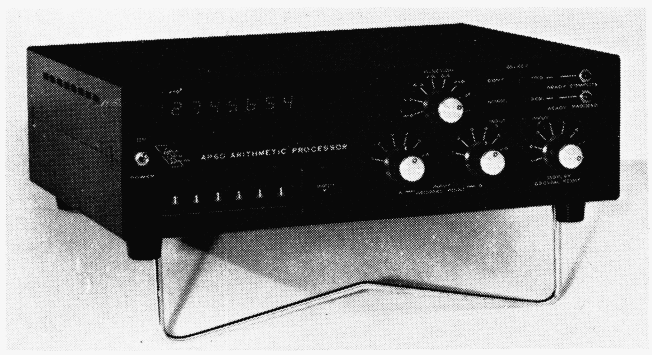
Bank Data System



The BANK-COMM 7 data system supports a bank's entire data-communications requirements and includes the Voicepac-2000 audio-response unit as a major component. The system permits loan personnel to obtain the complete payment history on given loans while management is simultaneously accessing the computer for the vital information essential to control the daily operations of a bank. The BANK-COMM 7 offers a full range of on-line devices, including touch-tone telephones, CRTs, and teleprinters. Use card or write *Periphonics Corporation, Airport International Plaza, Bohemia, New York 11716.*

Write in 301 on Coupon on page 71

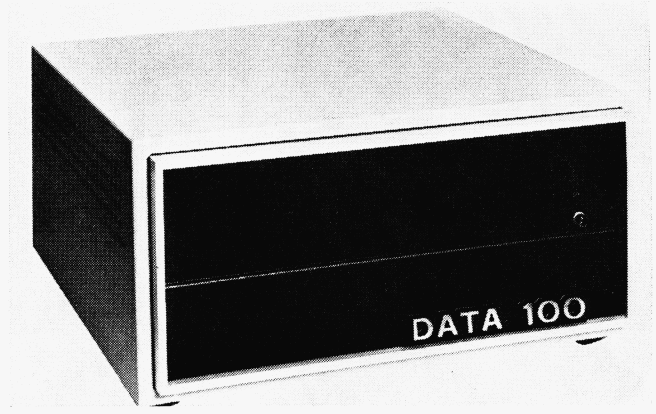
Arithmetic Processor



Accepting two BCD inputs from data sources (counters, DVMS, digital meters, and others), the AP60 arithmetic processor will process those inputs against each other and deliver the result in an eight-digit display and/or to its own BCD output for printout, remote display, or further processing by another AP60. The AP60 performs a choice of five basic functions on the input signals—addition, subtraction, multiplication, division, and squaring. The AP60 can be used in continuous operation—performing a new calculation every 800 ms, triggered operation—performing only upon command (manual or start pulse), or in a sequential mode. Use card or write *Tucker Electronics Company, Post Office Box 1050, Garland, Texas 75040.*

Write in 302 on Coupon on page 71

Modem Pair Simulator



A modem pair simulator (MPS) is designed as a short-haul, high-speed modem replacement on private lines. It can accommodate synchronous serial data transmission for distances up to 10 miles on two sets of twisted-pair wire. The simulator offers transmission speeds of 2400, 4800, or 9600 b/s. Use card or write *Data 100 Corporation, 7725 Washington Avenue South, Minneapolis, Minnesota 55435.*

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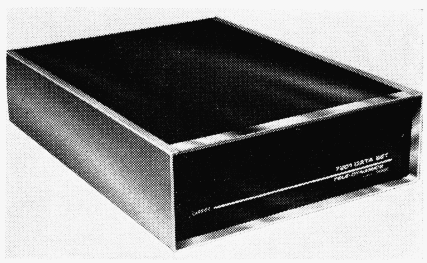
Data Modem



The Model 7201A/B data modem is an interchangeable replacement for Bell 201A and B data sets and features full-duplex 2000 or 2400-b/s automatic or manual answer. The unit is available in PC-card version for OEM; as a stand-alone complete with power supply, barrier strip termination, business machine connector, and power cord; or in a multiple rack-mounting adapter that houses up to five complete data sets. It uses Type CBS or CBT DAA for automatic public-telephone-network operation, or CDT for manual only. Use card or write *Tele-Dynamics Division, AMBAC Industries, 525 Virginia Drive, Fort Washington, Pennsylvania 19034.*

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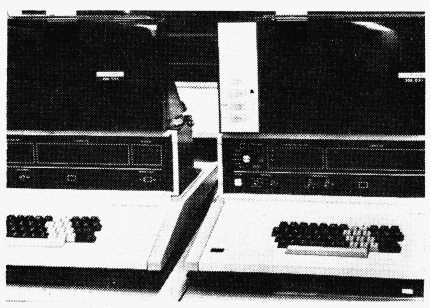
Data Terminals



The DT1000 Series of data terminals offers data capture, IBM-compatible communications, and a broad range of input/output peripherals for remote job entry and remote batch applications. The DT1000, in its simplest form, consists of a standard data-entry keyboard, a control panel to select operating modes, a display panel, 2770-compatible communications electronics, and a computer-compatible magnetic-tape drive. The DT1000's synchronous electronics include unattended answer-back capabilities and can communicate via telephone lines up to a maximum of 19,200 b/s. Use card or write *Pertec Corporation, Department 1000, 9600 Irondale Avenue, Chatsworth, California 91311.*

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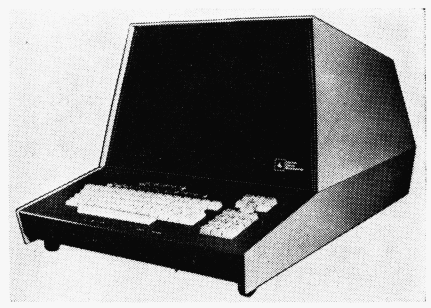
Display Terminal



The Delta 5000 is an improved version of the TelTerm series of display terminals, and it consists of the 5100, the 5200, and the 5300 which is used for multidrop environments. The 5000 extends the capability of the display series in that it has a programmable keyboard which can be modified to solve customers' problems. A single key stroke can generate messages up to 95 characters long or generate instructions up to 95 characters. The 5200 is programmed to accommodate various functions required by users of display terminals. Use card or write *Delta Data Systems Corporation, Woodhaven Industrial Park, Cornwells Heights, Pennsylvania 19020.*

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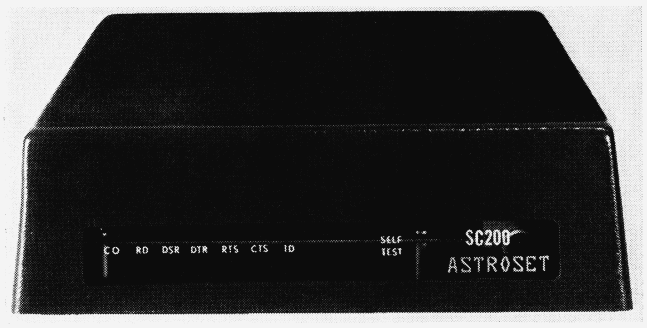
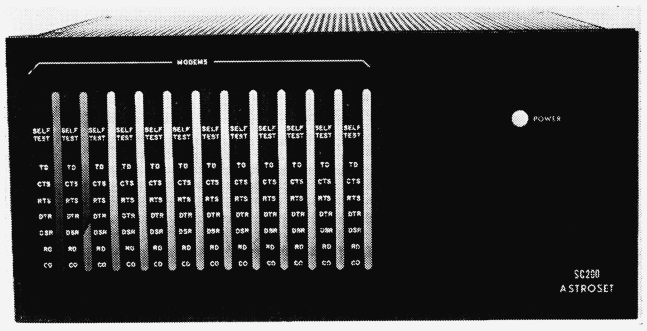
Communications Systems





The Astroset SC200 Series of data-communications systems are designed for synchronous operation between data processors and sophisticated man-machine interface equipment. The units operate over private or dedicated leased lines. The SC200 Series units may be obtained in either attractive free-standing cabinets, or rack mounted. The Series SC200 uses a digital modulation system which requires a narrow total bandwidth for high data rates. Rates include 2400, 4800, and 9600 b/s (Series 210); 2000 b/s (Series 220); 2400 b/s (Series 224); 3600 b/s (Series 236); 4800 b/s (Series 248); 7200 b/s (Series 272); and 9600 b/s (Series 296). Use card or write *Astrocom Corporation, 15012 Minnetonka Industrial Road, Minnetonka, Minnesota 55343.*

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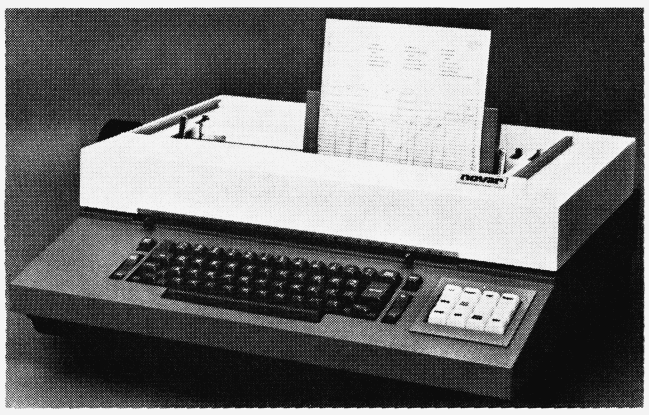
Financial Terminal



The Novar 5-43 financial terminal is designed primarily for entry of on-line transactions by consumer finance institutions. Incorporating fourth generation integrated-circuit technology, the 5-43 is equipped with the Selectric typewriter and financial keyboard featuring a shift key that permits the selection of two operating modes, the transaction mode or the standard data-entry mode. Among the terminal's special features are a split platen and document insertion device, as well as a STAK buffer. Standard transmission speeds are 75 or 134.5 b/s. Use card or write *GTE Information Systems, Four Corporate Park Drive, White Plains, New York 10604.*

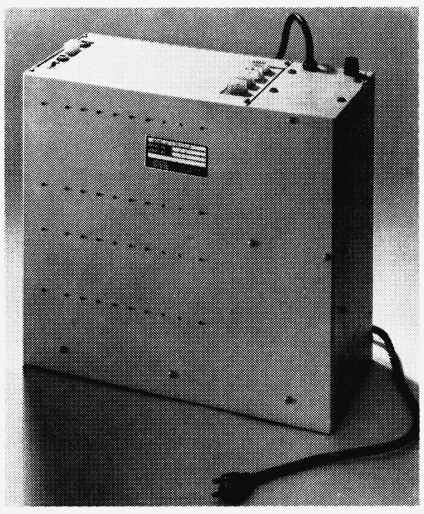
Write in 308 on Coupon on page 71

Digital Data Links

The LDL Series of digital data links provides a means of transmitting synchronous digital data in a reliable manner over a short-haul line-of-sight path, at rates up to 1.544 megabits per second. An LDL link-end comprises two basic assemblies—the transmitter/receiver unit (outside unit) and the interface unit (inside unit). The LDL's utilize a pulsed, infrared, gallium-arsenide laser diode for the transmitter carrier source. The data link can be operated at any predetermined rate up to the capability of the unit, with standard rates available in increments of 75×2^n up to 38.4 kB/s, plus 4.08 kB/s, 105 kB/s, 240 kB/s, and 1544 kB/s (Tl carrier system). Use card or write *Optical Communications, 2111 West Central Boulevard, Orlando, Florida 32805.*

Write in 309 on Coupon on page 71

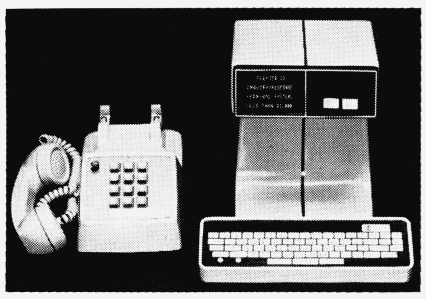
Terminal Buffers



A new series of terminal buffers for communications and electronic data processing operates at 1200-baud speed to provide fast message handling with editing. The buffers eliminate the need for paper or magnetic tape. The core of the terminals is the Model 7132 terminal buffer unit. This unit contains a solid-state memory which holds data to provide an interface between 1200-baud communications channels and low-speed devices such as teleprinters. A 4000-character memory provides storage equal to one full page. Use card or write *Pulse Communications, Post Office Box 1225, Alexandria, Virginia 22313.*

Write in 310 on Coupon on page 71

Terminal System



SCEPTER II is an inquiry/response terminal system that operates over the dial-up telephone network and is designed for applications including customer service, order entry, credit verification, and banking. A self-contained 103 type modem provides compatibility with all major CPUs. The elastomeric keyboard unit has all 128 ASCII characters. The display unit operates at asynchronous speeds up to 300 baud to format up to 16 alphanumeric characters per line on four lines. Use card or write *Di/Phase Incorporated, 914 North Rengstorff Avenue, Mountain View, California 94040.*

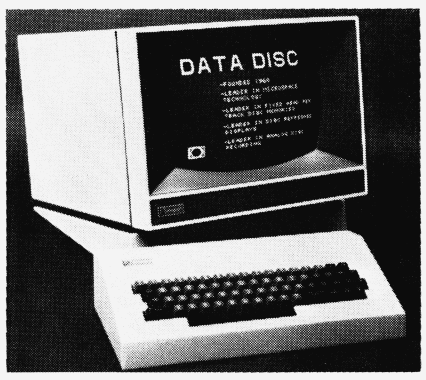
Write in 311 on Coupon on page 71

Teletypewriters

Modern design and quiet operation are combined in two keyboard send/receive teletypewriters. Model 123 KSR operates at 10 c/s while the 150 KSR is switchable to 10 or 15 c/s. Receive-only teleprinters are also available in the 123 and 150 models. The printers can be pedestal-mounted or desk-mounted with remote electronics. The paper-handling mechanism carries fan-folded single, multicopy, or roll paper. Model 123 and 150 impact printers print the 64-character ASCII subset. Use card or write *MITE Data Equipment, 446 Blake Street, New Haven, Connecticut 06515.*

Write in 312 on Coupon on page 71

Graphic Displays



Multichannel, graphic-display systems are designed to provide up to 16 independent display channels. These channels can be used to drive TV monitors in a multiterminal configuration, or channels can be combined for color displays or for form-overlay applications. Graphs and charts are made up of over 0.25-million individually addressable points, and up to 3200 alphanumeric characters may be displayed on the screen at one time. Use card or write *Data Disc, 686 West Maude Avenue, Sunnyvale, California 94086.*

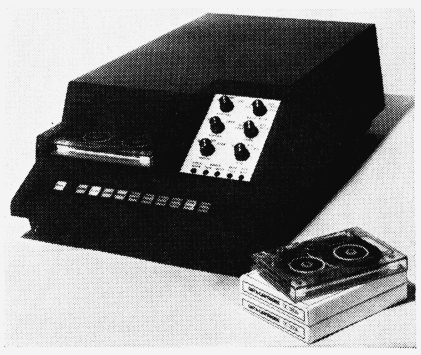
Write in 313 on Coupon on page 71

I/O Printer

The Model CSR-8E input/output hard-copy printer is a complete system which uses an IBM Selectric typewriter, a baseplate, power supply, and an omnibus interface. The baseplate is factory-installed on the customer-supplied typewriter. The system is designed to operate at 15 c/s, using the standard DEC Teletype software, with all 128 ASCII characters capable of being generated from the typewriter keyboard. In addition, the Model CSR-8E suppresses echo return, thereby providing direct use of the existing software, and has a special key designated to generate the ASCII control functions. Use card or write *Terminal Equipment Corporation, 750 Hamburg Turnpike, Pompton Lakes, New Jersey 07442.*

Write in 314 on Coupon on page 71

Cartridge Unit



A tape-cartridge communication terminal utilizes the 3M DC300A magnetic-tape cartridge. The device uses standard EIA RS232-B/C interface, and operates at baud rates of 110, 150, 300, 600, 1200, and 2400 b/s. Data may be received at one baud rate and transmitted at any other baud rate. Tape speed for read, write, and search (forward and reverse) is 30 inches-per-second, with 90 in/s for fast forward and reverse, and rewind. Tape status (BOT, early warning, and EOT) is monitored, and appropriately indicated. Write lockout inhibits record and erase functions. Use card or write *Wabash Computer Corporation, Equipment Division, 10202 North 19th Avenue, Phoenix, Arizona 85021.*

Write in 315 on Coupon on page 71

Data Console

The Data-Kap 910 transmitter/console houses and controls keyboard display and recorder modules for computerized order entry. Lighted pushbutton controls provide for record, send, and verify (read) functions. The console operates from line voltage and also contains an automatic battery charger. The 910 is designed to permit use with an acoustic coupler, Data-Phone, or data access arrangement for transmission of data over voice-grade telephone lines to the computer center. Use card or write *Electronic Laboratories, 3726 Dacoma Street, Houston, Texas 77018.*

Write in 316 on Coupon on page 71

Unique new study analyzes business opportunities in the booming

Medical Communications Equipment Market

This new Frost & Sullivan report is designed to help qualified firms capture a share of this market which is expected to generate sales of $462 million during the next five years.

Forecasts through 1980 are made for nurse call systems, MATV Systems, Television sets, private telephone systems, intercom systems, radio paging, doctor's registers, dictation systems, bed status systems, teletypewriters, dial access systems, facsimile equipment, data communications, two way monitoring, clock systems and building control systems.

The report analyses the communications market for hospitals, nursing homes, and schools. Suppliers are identified and their products, marketing, and financial resources are described.

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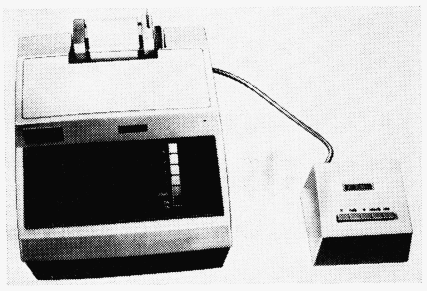
106 Fulton Street
New York, N.Y. 10038

Circle 58 on Reader Service Card

New in Data . . .

Continued from previous page

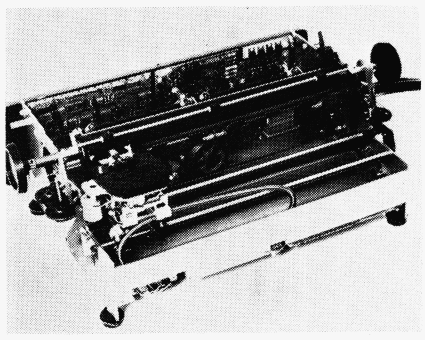
Digital Printers



A family of digital printers includes paper-strip and programmable-carriage printers, in bench-type or rack-mountable versions, with five to 16 digits. Maximum speed is 4 lines—or 64 characters—per second. The units accept 1-in-10 code or BCD code (1-2-4-8, 1-2-4-2, or 1-2-2-4) information. All printers are equipped with an interrogation unit. Each decade is being interrogated simultaneously, permitting simultaneous printout of all digits. Use card or write *Traco Incorporated, 509 Rolling Hills Road, Somerville, New Jersey 08876.*

Write in 317 on Coupon on page 71

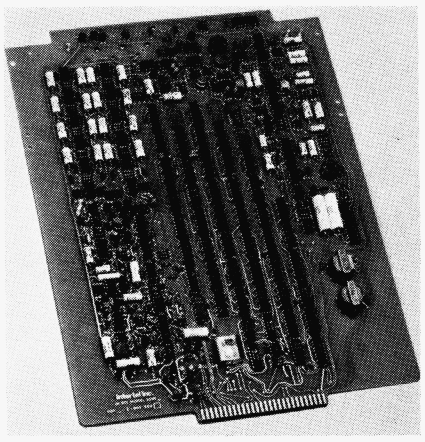
Serial Printer



The HyType I Model 1200 serial printer prints an original and five clear copies, using standard carbon forms. The printer prints 30 c/s up to 132 columns per line, 48 lines per vertical inch. The HyType I character wheel, termed a "Daisy", is a plastic disk with 96 "petals", each carrying one of the print characters. The operator may snap in a different character wheel to change type styles or fonts, including foreign language. Ribbon, fabric, or one-time carbon, one or two-color, is contained in a snap-in cartridge. Use card or write *Diablo Systems, Incorporated, 24500 Industrial Boulevard, Hayward, California 94545.*

Write in 318 on Coupon on page 71

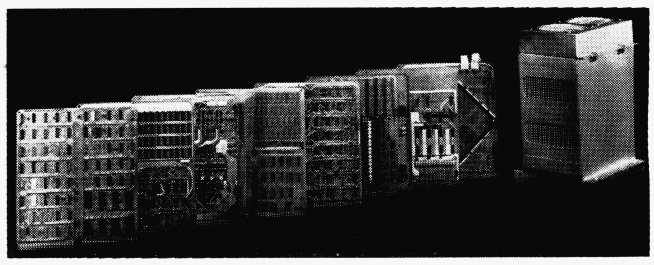
Integral Modem



An integral modem, Model 2010, provides fully Bell 201B compatible operation at 2400 b/s on two- or four-wire unconditioned private lines. Standard features include automatic fast sync, new sync, clear-to-send delay, carrier detect, external/internal transmitter timing, and MARK hold on receive data when carrier is lost. The modem can also be operated at 2400 b/s on the DDD network when connected to a CDT data access arrangement. The Model 2010 achieves an error rate of less than 1 bit in 10^6 at a signal-to-noise ratio of 15 dB. Use card or write *Intertel, 6 Vine Brook Park, Burlington, Massachusetts 01803.*

Write in 321 on Coupon on page 71

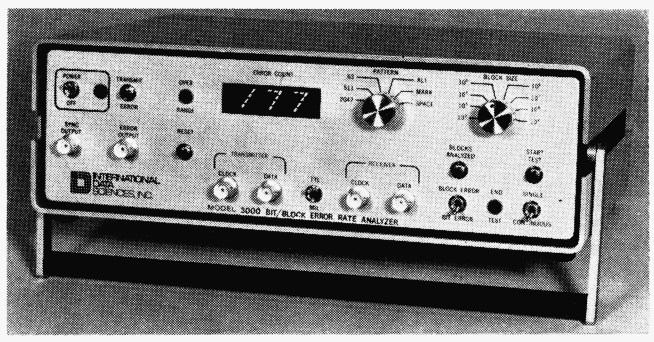
Programmable Controllers



The 600 Series controllers were developed for numerical, peripheral, communication, and process control applications. The variety of modules available allows the design engineer maximum flexibility when specifying or designing a controller to meet his exact requirements. The controllers offer microprogrammed standard modules (each on a single printed-circuit board mounted and interconnected in one chassis assembly), simplified programming, instruction repertoire, field modification and expansion, essential functions only, program development and support system, and a maintenance console. Use card or write *MDS-Atron, Incorporated, 1256 Trapp Road, St. Paul, Minnesota 55121.*

Write in 324 on Coupon on page 71

Error-Rate Analyzer



The portable Range Ridger Model 3000 bit/block error-rate analyzer offers full-duplex operation up to 10 Mb/s in both TTL and MIL 188 interfaces, three-digit LED display of both bit and block error rates, six patterns, selectable block sizes of 10^2 bits, single and continuous bit and block error testing, self-test capability, digital-recorder option, and remote computer control and data-access capability. Through front-panel switch settings and remote computer commands, data in the form of 63, 511, or 2047-bit pseudo-random patterns is transmitted, received, and analyzed. Use card or write *International Data Sciences, 100 Nashua Street, Providence, Rhode Island 02904.*

Write in 325 on Coupon on page 71

IN CASE YOU MISSED IT

in the August issue of Communications

Chautauqua's better idea:

A mobile van to service the nearly 600 two-way radios used by the Chautauqua County Highway Department, Civil Defense, county fire service and Sheriff Department. The complete radio laboratory on wheels belongs to the Communications Division of the County's Office of Civil Defense under the direction of Communications Officer Charles Hagstrom.

The van's comprehensive complement of test equipment includes One Bird model 6154 Termination Wattmeter and Two Bird model 43 THRULINE Wattmeters.

Experienced communications managers rely on Bird RF wattmeters when there is no room for error. Why don't you?

Model 6154
5/15/50/150 watt scales

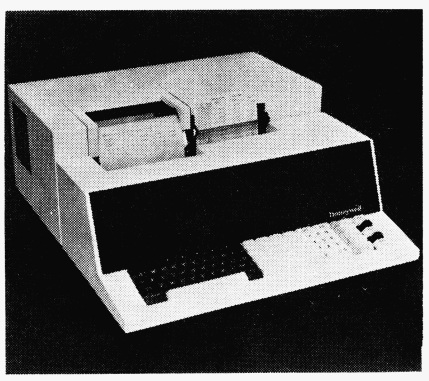
We also make Load Resistors 2 watts to 50 kilowatts.

Model 43
450 kHz - 2300 MHz
1 - 10,000 watts

BIRD ELECTRONIC CORPORATION
30303 AURORA RD.•CLEVELAND (SOLON) OHIO 44139
Phone 216-248-1200 • Cable BIRDELEC

Circle 59 on Reader Service Card

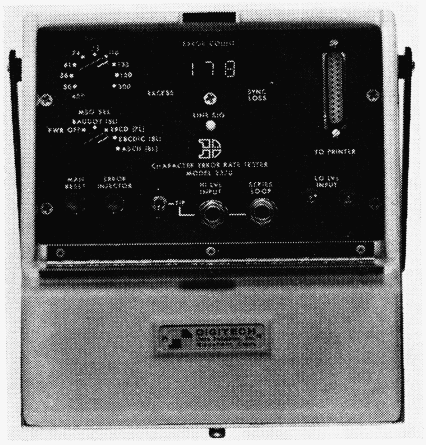
Teller Terminals



Two electronic teller terminals are the Type 7330, a fixed-sequence terminal, and the Type 7340, a programmable-sequence terminal with a number of options. The terminals can be operated at a bank teller's window in a communication mode on-line to a central computer to handle all necessary customer transactions, such as posting of deposits, withdrawals, and savings-account interest. Twelve characters per inch are printed at the rate of 20 c/s in 72 positions for journal posting and 74 positions for passbook posting. Use card or write *Honeywell Information Systems, 60 Walnut Street, Wellesley Hills, Massachusetts 02181.*

Write in 319 on Coupon on page 71

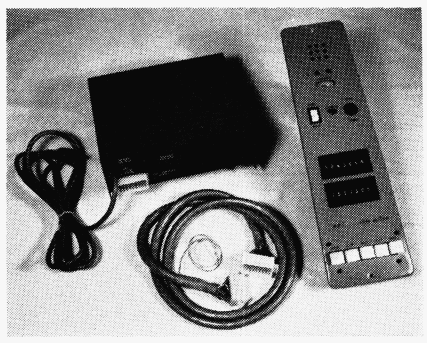
Error Tester



The Model 2370 character error-rate tester (CERT) is ideal for error-rate measurements of character-oriented systems, such as time-division multiplex, regenerated asynchronous systems, encrypted systems, and others. It operates in conjunction with conventional "Quick Brown Fox . . ." message generators in four code/language structures: Baudot (ITA #2), ASCII, EBCD (IBM 6-bit), and EBCDIC. The 2370 operates on 10 standard synchronous speeds. Use card or write *Digitech Data Industries, 66 Grove Street, Ridgefield, Connecticut 06877.*

Write in 320 on Coupon on page 71

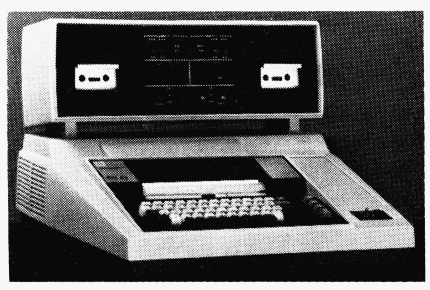
Preset Dialer



An automatic preset dialer is designed for use with the company's 103GM, 300-baud, direct-access, originate and automatic-answer data sets for Teletype installations. Two versions presently available allow the telephone number to be either preset by the operator with the thumb-wheel switches on the panel, or the number to be hardwired into the electronics package. The dialer consists of a call control panel that mounts in a Model 33 or 35 Teletype and contains necessary operator controls and indicators, and the electronics package. Use card or write *Design Elements Division, MI² Data Systems, 1356 Norton Avenue, Columbus, Ohio 43212.*

Write in 322 on Coupon on page 71

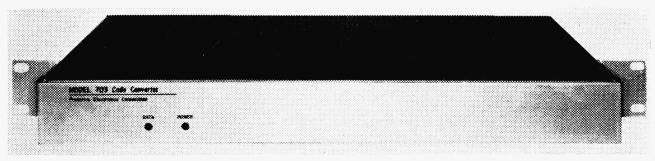
Data Terminals



Two new models of data terminals include the twin magnetic-tape cassette, automatic send and receive model, and the keyboard send and receive version. The twin-cassette model offers data transmission rates of 10, 15, 30, and 120 c/s, a simultaneous transmit and receive capability, and simultaneous on-line transmission and off-line data preparation. The KSR version features quiet, 30-c/s electronic printing. The Model 733 terminals are suited for point-to-point data communications networks, computer time-sharing systems, and other uses. Use card or write *Texas Instruments, Post Office Box 1444, Houston, Texas 77001.*

Write in 323 on Coupon on page 71

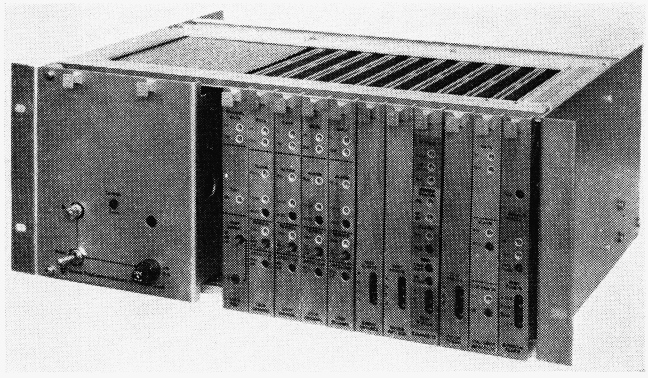
Data Code Converter



A data code converter, Model 703, is designed to economically transform five-level Baudot characters to eight-level ASCII format. The compact unit allows existing Baudot equipment to work into ASCII systems with complete compatibility and has programmable input and output speeds from 37.5 b/s to 2400 b/s to match communication and computer standards. The unit uses an integrated-circuit ROM to perform the character conversion on a one-to-one basis. One character at a time, the ROM processes the information and an equivalent ASCII character is generated. Use card or write *Plantronics, 385 Reed Street, Santa Clara, California 95050.*

Write in 326 on Coupon on page 71

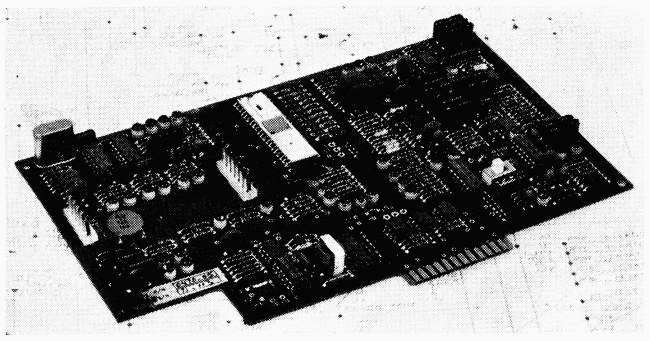
Channel Subdivider



The Type CSD-1 channel subdivider is a character-interleaved time-division multiplexer designed to concentrate a number of fractional speed (½ or ¼ character rate) asynchronous telegraph loop channels (half or full-duplex) into a single, full-speed, full-duplex loop composite channel. The unit provides for error-free data transmission at any baud rate from 37.5 to 110 with channel operation at 5, 6, 7, or 8 data bit characters. Composite and channel interfaces on the channel subdivider are available as 20 or 60 mA, polar or neutral isolated loops. Use card or write *General DataComm Industries, 537 Newtown Avenue, Norwalk, Connecticut 06851.*

Write in 327 on Coupon on page 71

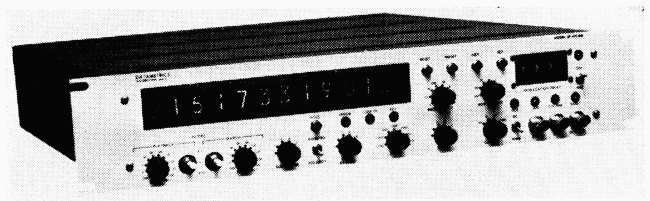
Plug-in Card Modem



A 1200/1800-baud plug-in card modem, designated the 202 Series, allows a single 45-cubic-inch board to accommodate all Bell 202 C/D/E options and many customer specified features. The reverse-channel option gives either 5-baud supervisory or 150-baud data channels while receiving data from the processor at 1200 baud over normal 3002 unconditioned lines. Standard features include automatic answer, line transformers, line test, regenerate test, and compromise equalizer. Strappable features include transmit level, receive squelch duration, echo suppressor disable, data clamp, local copy inhibit, clear-to-send delay duration, soft carrier turn off, and full or half duplex. Use card or write *Novation, Incorporation, 18664 Oxnard Street, Tarzana, California 91356.*

Write in 328 on Coupon on page 71

Time-Code Generator/Reader



The Model SP-425 multiple time-code generator/reader provides the capability of generating or reading up to seven serial time codes selected by a front-panel switch. The unit can display up to 12 digits of time from days to milliseconds and has selectable options to expand the basic unit to include WWV sync, capability, propagation delay, compensation, slow code generation, selectable playback filters, error by-pass, and auto reverse/forward reading. Use card or write *Datametrics, 127 Coolidge Hill Road, Watertown, Massachusetts 02172.*

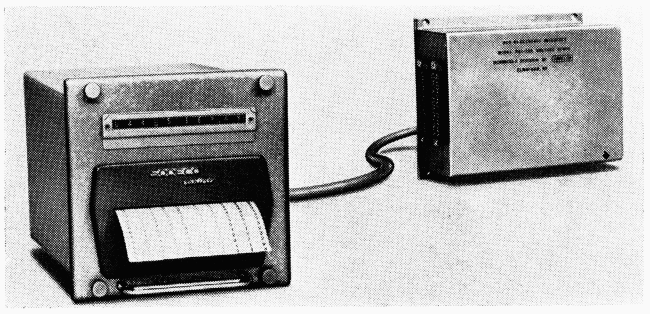
Write in 329 on Coupon on page 71

Disk Memory System

A disk memory system, called the Series 6000, combines a closed-loop track-following system and special narrow 3330-type heads to achieve 666 tracks per inch. Two models are offered: the 6001, with a capacity of 62 Mb with 40-ms access; and the 6002, with a capacity of 5 Mb and 15-ms access. Both models have a high transfer rate up to 853 kb/s. Intended for use with minicomputers, the systems have a microprogrammed controller. Use card or write *OMI Memories, Incorporated, 5261 West Imperial Highway, Los Angeles, California 90045.*

Write in 330 on Coupon on page 71

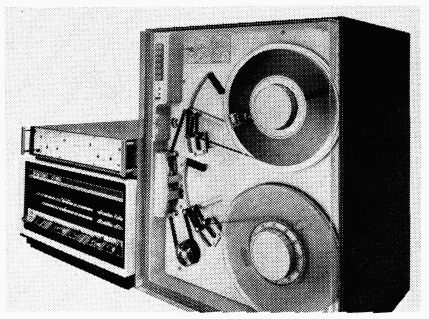
Printer Interface



The Series P-100 printer interface adds BCD capability to the company's line of counter-printers. The printer interface can accept up to 10 columns of BCD-encoded parallel entry data, converting this information into a serial pulse train to interface at a rate of one line per second. The P-100 Series has a capability of up to 15 characters per column. Featuring solid-state circuitry and reliability, the P-100 eliminates the need for continuously operated fans, drive motors, or wiping contacts for data signals. Use card or write *Sodeco, A Division of Landis & Gyr, 4 Westchester Plaza, Elmsford, New York 10523.*

Write in 331 on Coupon on page 71

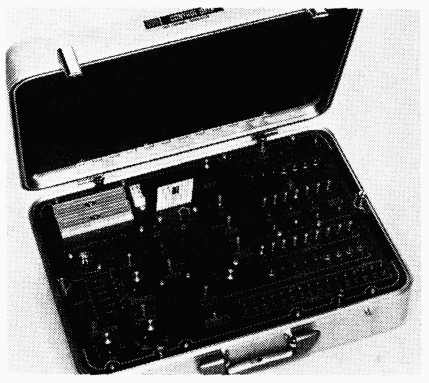
Tape System



The PI tape system includes a PI-1400 digital magnetic tape recorder, computer interface, formatting electronics, and a complete software package. Dual-density 800/1600-b/in read/write electronics are standard. The seven-channel unit has 200, 556, or 800-C/in electronics (choice of two). The nine-channel recorder interfaces in either 800-c/in, NRZ1, or 1600-c/in phase-encode mode. Standard tape speeds are 12.5, 25, 37.5, and 45 in/s. Use card or write *Precision Instrument Company, 3170 Porter Drive, Palo Alto, California 94304.*

Write in 332 on Coupon on page 71

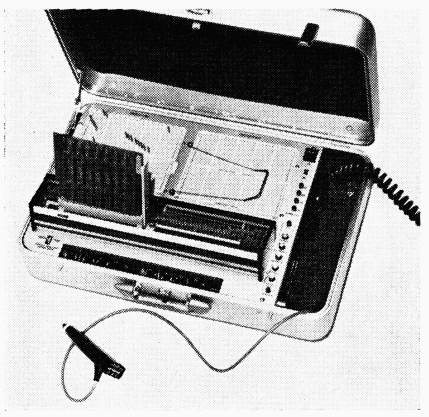
Controller



A suitcase-sized, programmable controller, designated Model 9920, provides off-line simulation of System/360 selector and multiplexor channel input-output sequences for use in on-site system maintenance and factory checkout. The unit incorporates MIS memory technology and a 1-μs cycle time in a watertight aluminum case weighing 30 pounds. The 9920's manual keys allow even the nonprogrammer to generate his own checkout programs and store any two such independent programs, each of up to 128 ten-bit words, on a single 2 x 3.5-inch magnetic oxide card. Use card or write *Control Data Corporation, Post Office Box 0, Minneapolis, Minnesota 55440.*

Write in 333 on Coupon on page 71

Circuit Analyzer



The Model 2000B portable circuit analyzer features a hand-held high-impedance probe for inspection and diagnostic analysis of digital logic circuits. A four-digit display in the probe shows the results of logic transitions from the inputs to any point in a circuit. Also on the probe are the start-test push button, a level-set control, and indications (LED) showing relative level and end-of-test. The 2000B functionally tests each output or intermediate point in a digital circuit by displaying the total number of truth-table transitions occurring between the inputs and the point of probe contact. Use card or write *Data Test Corporation, 822 Challenge Drive, Concord, California 94520.*

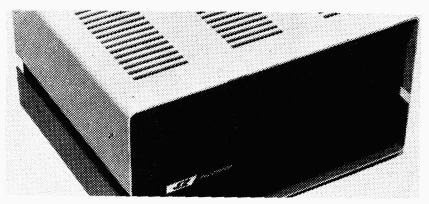
Write in 334 on Coupon on page 71

Interface

A data-terminal interface provides serial ASCII code (RS-232) output from a 128-channel analog data-acquisition system (Model 3900 "Astroverter"). Designated the Astroverter data-terminal interface, the system consists of five printed-circuit cards—three in the basic system, a fourth for remote control, and a fifth to "Time Mark" the data stream. In operation, switches on one of the basic interface system cards allows selection of baud rates at 110, 115, and 300, or from an external clock with rates up to 10 kHz. Use card or write *Moxon Incorporated, SRC Division, 2222 Michelson Drive, Irvine, California 92664.*

Write in 335 on Coupon on page 71

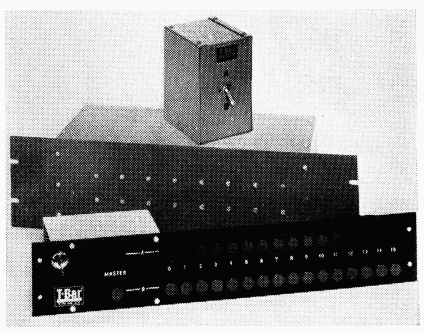
Multiplexer



The SPD-M multiplexer interfaces the SPD 10/20 display to a single modem and communication line or, alternatively, to another multiplex unit. Up to 16 data terminals, modular by eight, may be interfaced with the multiplexer at one site. The SPD-M operates in a single or multidrop environment with communication traffic controlled by a central-processing-unit-oriented polling system. The multiplexer interfaces directly to any EIA RS232-C compatible modem for all transmission speeds from 110 baud to 4800 baud. The unit operates in half or full-duplex configurations, synchronously or asynchronously. Use card or write *Incoterm Corporation, 6 Strathmore Road, Natick, Massachusetts 01760.*

Write in 336 on Coupon on page 71

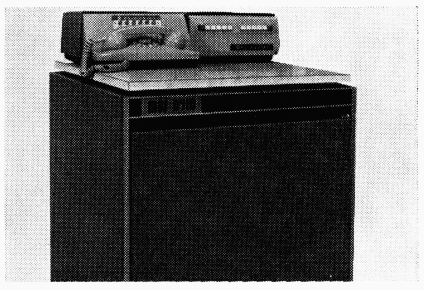
Data Switches



The Model 5700 manual-operated and Model 5000 remote-operated switches permit reconfiguration of communications channels between computers and modems or telephone data sets. Model 5700 switches, designed for line monitoring and fall-back operations, use Data-Rite 24-pole DT toggle switches. Up to 10 panel-mounting units may be assembled in a 19-inch rack panel. Model 5000 push-button-operated assemblies are designed for six different applications: Series 5100, fall-back; Series 5200, monitor; Series 5300, line test and monitor; Series 5400, spare modem; Series 5500, dial-up line bypass; and Series 5600, traffic director matrix. Use card or write *T-Bar Incorporated, Wilton, Connecticut 06897.*

Write in 337 on Coupon on page 71

On-Line Controller



The Model 2710 communications controller is available for use with the company's data-entry and transmission systems where direct on-line receiving is desired. The 2710 includes one 2711 line controller as a standard feature and up to three more may be added. Each line controller interfaces to an AT&T 202C dataset. If automatic dialing is desired for any lines, an AT&T 801 automatic calling unit is required for each such line. Under program control, the lines may be operated in the same manner as an off-line receiver: attended, unattended (automatic answer), or automatic dialing. Use card or write *MSI Data Corporation, 1381 Fischer Avenue, Costa Mesa, California 92627.*

Write in 338 on Coupon on page 71

Digest of
COMMUNICATION
LAW

A twice monthly newsletter that keeps you advised of FCC rule changes, court decisions, and Congressional actions affecting radio communications. For further information and sample copy, write:

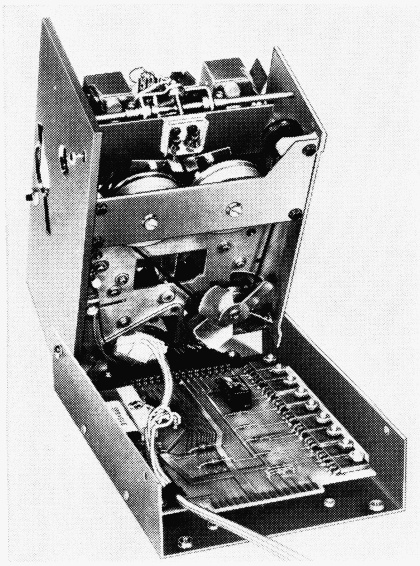
COMMUNICATION LAW
Box 8357
Knoxville, Tennessee 37916

Circle 19 on Reader Service Card

New in Data . . .

Continued from previous page

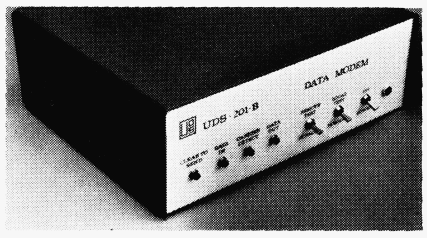
Memory Systems



The TERMI-138 Series of digital cassette memory subsystems currently have available four models including the TERMI-138B, deck only with optional mechanical enhancements; TERMI-138E, featuring EIA RS-232-C; TERMI-138P, parallel I/O subsystem; and the TERMI-138S, complete read/write subsystems. Operating features include bidirectional speeds of 2-15 in/s, normal fast-forward/reverse speed of 60 in/s, standard hysteresis synchronous capstan motor or optional DC servo-controlled capstan motor, and a two-track digital grade magnetic head or two-track read-after-write head. Use card or write *Telex Communications Division, Data Products Group, 9600 Aldrich Avenue South, Minneapolis, Minnesota 55431.*

Write in 339 on Coupon on page 71

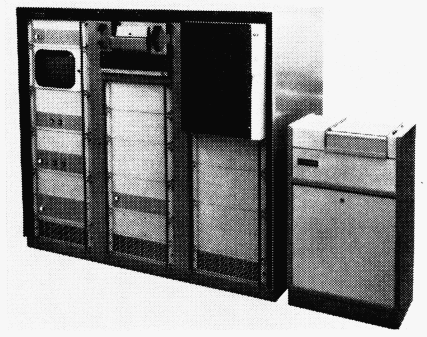
Data Modem



The Model UDS-201B data modem provides private four-wire full-duplex or two-wire DDD synchronous transmission at 2400 b/s. The modem features local and remote test capabilities, LED indication for operator monitoring, and 8.5-ms turnaround time. Use card or write *Universal Data Systems, 4306 Governors Drive Southwest, Huntsville, Alabama 35805.*

Write in 340 on Coupon on page 71

Disk Memories



Minicomputer disk memories offer a range of capacities from 32,000 words to 1,573,000 words for most popular minicomputers. Rapid access time of 17 ms and high-speed data transfer rates (to 250,000 words per second) make these head-per-track disk memories ideally suited to core extension, program-overlay storage, and memory-swapping applications. Use card or write *Data Disc, 686 West Maude Avenue, Sunnyvale, California 94086.*

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This advertisement is not an offer to sell or a solicitation of an offer to buy these securities. The offering is made only by the Prospectus.

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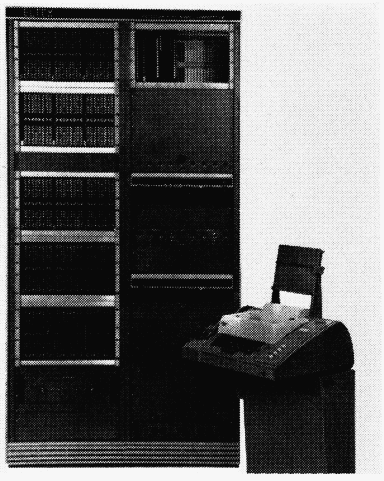
Henry F. Swift & Co. — Zuckerman, Smith & Co.

November 1, 1972

Circle 61 on Reader Service Card

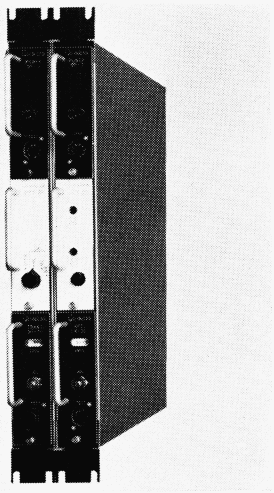
Telex Exchange



The ELTEX II fully electronic, automatic Telex exchange can serve as a concentrator, local exchange, trunk transit exchange, international gateway, or in any combination. Features include computer call processing, operational flexibility, minimum maintenance, reliable performance, time-division switching, preprogrammed software package, plus a wide range of available computer peripherals. The system can accommodate speeds greater than 200 baud, and ELTEX II can be expanded to handle up to 2016 lines and trunks. Use card or write *Frederick Electronics Corporation, Post Office Box 502, Frederick, Maryland 21701.*

Write in 342 on Coupon on page 71

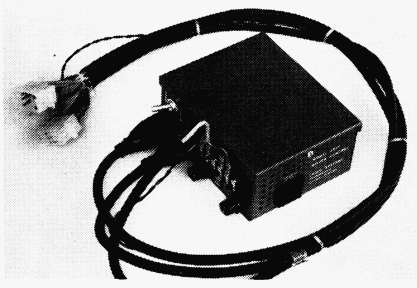
Telemetering Unit



The QATS-20 analog telemetering system permits accurate remote measurement of quantities that can be converted into DC voltages or currents. By means of variable frequency modulation of an FS audio tone channel, accurate readings of these quantities can then be transmitted any distance. Transmission can be over leased telephone lines, radio, or the switched network. Two signaling rates are available: 5 to 25 pulses per second plus 5 to 15 pulses per second for DC operation. Use card or write *Quindar Electronics, 60 Fadem Road, Springfield, New Jersey 07081.*

Write in 343 on Coupon on page 71

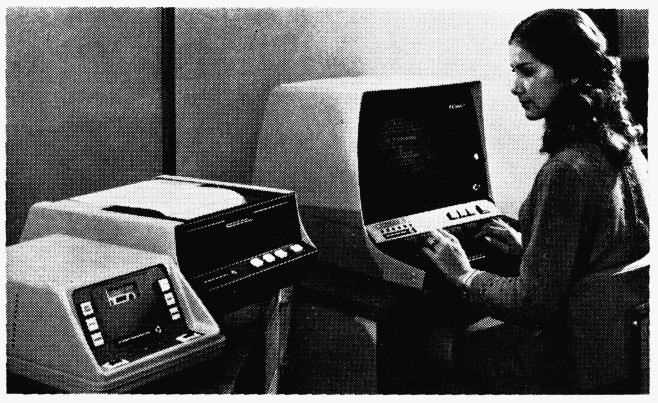
Motor Control



The Model 2017D motor control is specifically designed for full-duplex operation with the Model 33 ASR teletypewriter. The unit provides automatic on/off control of the Model 33 ASR in both send and receive modes. Advantages to the user are measured by increased equipment life and reduced maintenance, noise level, and power consumption. The motor control is equipped with all the necessary cabling and plugs for simple installation. Use card or write *Logic Systems Corporation, 1567 Cypress Drive, Jupiter, Florida 33458.*

Write in 344 on Coupon on page 71

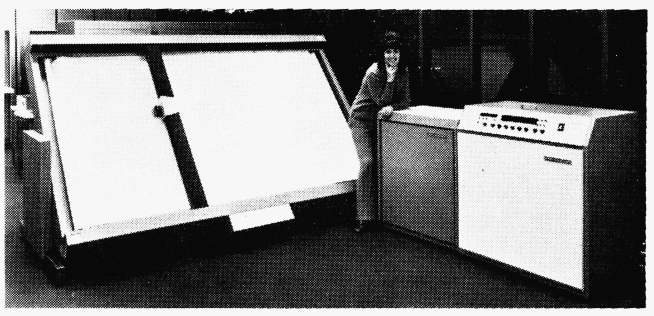
Video Display System



The VUcom I is a video display system which can show up to 1,280 characters on the screen at 9,600 words per minute. The basic peripheral units offered initially with the system are a magnetic-tape cassette recorder and single-copy or multicopy printers. The magnetic recorder, which performs the functions usually associated with paper-tape equipment, can store up to 50,000 characters on a single cassette. The nonimpact noiseless printer operates at speeds up to 30 c/s, using a thermal process on heat-sensitive roll paper. Use card or write *Trans-Canada Telephone System, Computer Communications Group, One Nicholas Street, Room 600, Ottawa, Ontario, Canada K1G 3N6.*

Write in 345 on Coupon on page 71

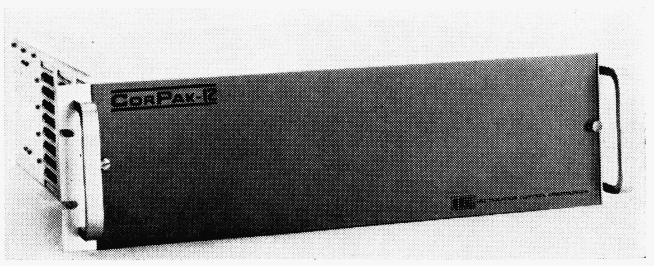
Flatbed Plotter



The Model 7900 flatbed plotting system is built around a Zip-mode large flatbed plotter. The 48-inch by 72-inch drafting surface and program-controlled four-pen block permit large-scale multiple-color or multiple-linewidth drafting. Optional accessories are available for cutting strippable films and scribing coated materials. The Model 7900 system includes a controller, high-speed magnetic-tape unit drive, and basic soft-ware. The plotting table features movable limit switches and electrically driven paper advance. Use card or write *California Computer Products, 2411 West LaPalma, Anaheim, California 92801.*

Write in 346 on Coupon on page 71

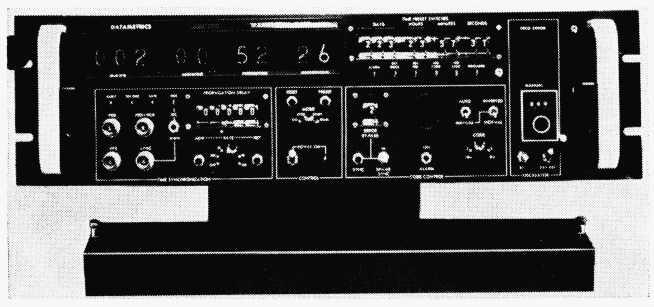
Add-on Memory



The CorPak-12 add-on memory package will allow PDP-12 minicomputer users to increase their core memory to 32K. If a user has a unit with just its basic 4K memory and wishes to expand it to its limit, he can add 28K bits. Use card or write *Information Control Corporation, 9610 Bellanca Avenue, Los Angeles, California 90045.*

Write in 347 on Coupon on page 71

Time-Code Generator



The Model SP-176 synchronized time-code generator employs a phase-lock technique that permits the unit to be time-synchronized to within a few microseconds of the on-time external time reference and has an internal time base that is automatically phase-locked to the incoming carrier frequency. The SP-176 is designed for time-correlating events at remote data sites with a Master Time Reference over a single communication channel, and in the event of communication dropout the Model SP-176 insures reliable and accurate operation. Use card or write *Datametrics, 127 Coolidge Hill Road, Watertown, Massachusetts 92172.*

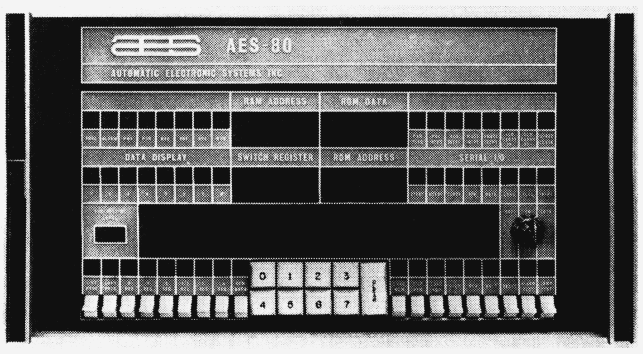
Write in 348 on Coupon on page 71

Computer System

The System/370 Model 125 offers up to 400 million characters of disk storage for key applications such as on-line inquiry and data communications. Metal-oxide-semiconductor field-effect transistor technology (MOSFET) is used for the Model 125's internal main storage circuits. Optional features of the unit permit direct attachment of up to six magnetic-tape drives and up to 22 communications lines for connection of remote terminals. A printer, card readers, and card-punching units can be directly attached, also. The Model 125 can read and punch both 80- and 96-column cards. Its main storage capacity is either 98, 304, or 131,072 characters of data. Use card or write *International Business Machines Corporation, 1133 Westchester Avenue, White Plains, New York 10604.*

Write in 349 on Coupon on page 71

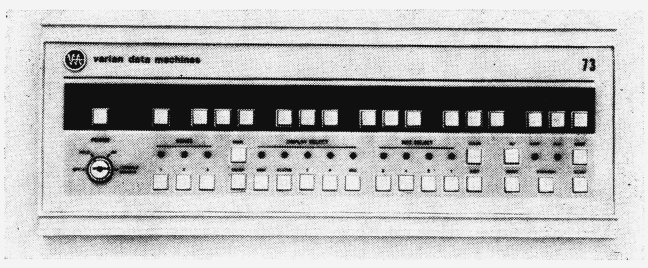
Support Console



A program development and control console for support of the AES-80 microprocessor reduces development time and provides a vehicle for on-line real-time simulation. Within the PDCC a high-speed random-access bipolar memory simulates the permanent ROM. Its contents, however, are alterable by loading instructions into it via the switch registers on the console, as ASR teletype, or a punched-tape reader. The front panel of the unit contains a complete set of indicators, displays, switches, and controls for program development, including controls for program listing and tape loading. Use card or write *Automatic Electronic Systems, 5455 Pare Street, Montreal 309, Quebec, Canada.*

Write in 350 on Coupon on page 71

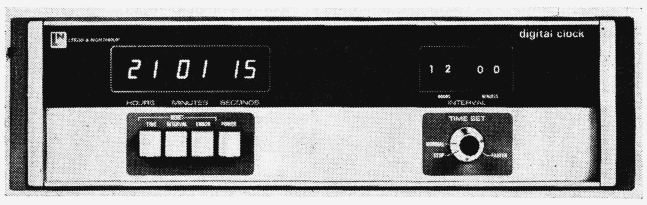
Asynchronous Minicomputer



The VARIAN 73 is a 16-bit, asynchronous minicomputer system combining user-accessible microinstructions, multiple busing, and data transfer rates over 3 million words per second on each bus. By adding a writable control store option, this microprogramming can be extended by the user to create special-purpose instructions and macroalgorithms. Programming efficiency is increased by a wide (64-bit) control word and 16 general-purpose registers. System 73 offers three memories with cycle times of 190 ns, 330 ns, and 660 ns. Use card or write *Varian Data Machines, 2722 Michelson Drive, Irvine, California 92664.*

Write in 351 on Coupon on page 71

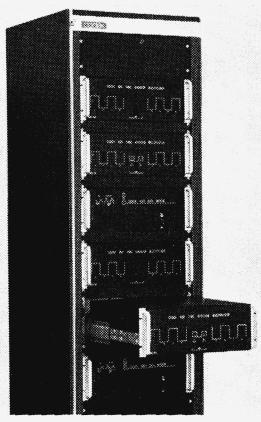
Digital Clock



A precision digital clock presents the time in hours, minutes, and seconds. Time can be monitored as real time in 12 or 24-hour time cycles, or systems time (up to 24 hours). The heart of the unit is an oscillator which is synchronized with the AC power line with a typical accuracy of 0.02 Hz. The oscillator is capable of working from a 50-Hz line. An interval timer provides a timed form C contact output (1-A rating) and is settable over a range of 10 minutes to 39 hours and 50 minutes, in 10-minute intervals. Use card or write *Leeds & Northrup Company, Sumneytown Pike, North Wales, Pennsylvania 19454.*

Write in 352 on Coupon on page 71

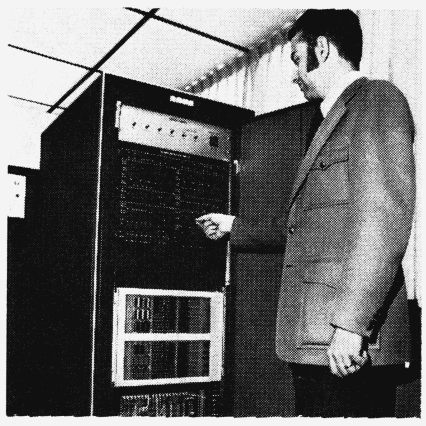
Comm System



A complete data communications system combines a 2400-b/s multipoint polled link and multiplexed traffic for sixteen 150-b/s terminals over a single 3002 unconditioned voice-grade line. The low-speed channels, which may be dial-in or colocated terminals, are multiplexed in an 810 time-division multiplexer. The 2400-b/s synchronous output is then connected to a port of the 4800 data modem. In the above configuration, the switch is set for two 2400-b/s ports. The first serves the 810 multiplexer and the second serves a completely independent 2400-b/s polled network. Use card or write *Codex Corporation, 15 Riverdale Avenue, Newton, Massachusetts 02195.*

Write in 353 on Coupon on page 71

Controller



A microprogrammed front-end communications controller will control up to 192 voice-grade lines at 2400 b/s for use with IBM System/360/370. The controller features "dial-in" capability. The multiline communications controller (MCC) is a fully compatible replacement for the standard IBM 2701-2-3 transmission-control units or the IBM 3705 operating in emulation mode. The dial-in feature enables remote terminals and printers to be interconnected to the System/360/370 using standard IBM program support in BTAM, QTAM, or TCAM through the switched network at 300, 1200, 2000, or 2400 b/s. Use card or write *Courier Terminal Systems, 2202 East University Drive, Phoenix, Arizona 85034.*

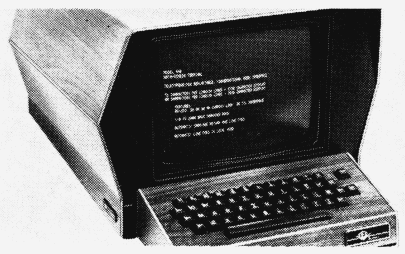
Write in 354 on Coupon on page 71

Audio-Reply Unit

The IT-160 Series alphanumeric audio-response computer terminals utilize ordinary voice-grade telephone lines to communicate to a central processing unit through any audio-response unit (such as the IBM 7770 Model III) able to handle ABB' coding. The terminal uses a thin-film hybrid solid-state oscillator to produce ABB' (extension of the Touch-Tone code set) signals. The keyboard on the IT-160 consists of 65 individual keys arranged in a five-row by 13-column matrix. Use card or write *Transcom, Incorporated, 580 Spring Street, Windsor Locks, Connecticut 06096.*

Write in 355 on Coupon on page 71

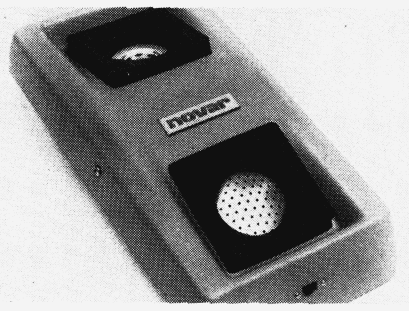
CRT Terminal



The Model 440 Teletypewriter replacement Data-Screen terminal offers switch-selectable rates from 110 to 9600 baud, split-rate transmission feature that allows data to be sent at one speed and received at another, and a choice of wood-grain or painted finishes. The 5 x 7 dot-matrix characters are selectable at 72 or 80 characters per line, 24 lines. The terminal also features automatic carriage return and automatic line feed and bottom-line data entry. Use card or write *TEC, Incorporated, 9800 North Oracle Road, Tucson, Arizona 85704.*

Write in 356 on Coupon on page 71

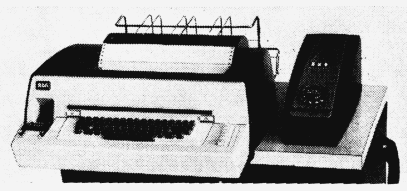
Acoustic Coupler



A new plug-in acoustic coupler has been designed specifically for use with the company's terminals. The couplers are said to be smaller, lighter, and lower in cost with performance "equal to the best of previously available models". Use card or write *GTE Information Systems, Four Corporate Drive, White Plains, New York 10604.*

Write in 357 on Coupon on page 71

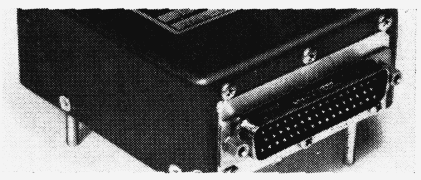
Teletypewriter



The Model 38ASR teletypewriter, available in Data-Phone or private line, features a 15-inch-wide pin-feed platen and prints upper and lower case (94 standard ASCII characters) on a full 132-character line. The attractive units are able to transmit messages and orders directly to any point in the system, as well as meet plant-administration, order-entry, computer-inquiry, and record-control requirements. Use card or write *RCA Service Company, Building 204-2, Cherry Hill Offices, Camden, New Jersey 08101.*

Write in 358 on Coupon on page 71

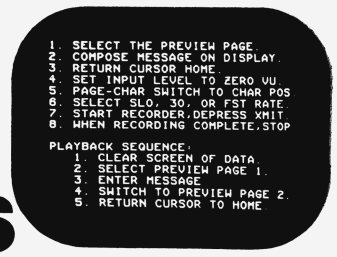
Multicoder

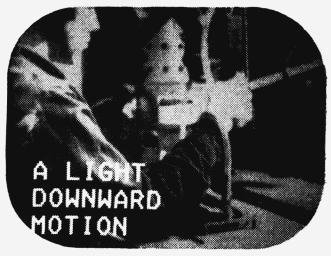


The Series 2060, LSI "Blueline", solid-state multicoder is designed for use in industrial data-acquisition systems and in aerospace time-division multiplexing. The commutating device samples up to 90 parallel information channels of 0 to 5 V and displays them in either PAM, PDM, or PPM format in serial mode at the output. The multicoder uses the latest large-scale-integration techniques with proprietary fail-safe circuitry, all preaged under prescribed temperature conditions. Use card or write *General Devices, Incorporated, Department HB, Post Office Box 253, Princeton, New Jersey 08540.*

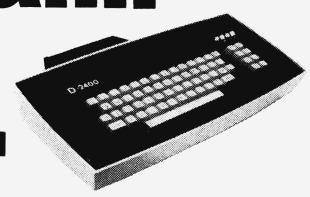
Write in 359 on Coupon on page 71

All Character Generators Are Not Created Equal...





That's Why More Professional Users Are Choosing Datavision Character Generators!



- BECAUSE Datavision Character Generators are minimum-cost, maximum-capability generators, available for immediate delivery — for *under $5,000!*
- BECAUSE Datavision Character Generators help you produce more comprehensive, timely, informative and professional presentations:
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  - More Effective Information/Paging Networks
  - More Informative Training Sessions
  - Expanded Local Program Origination for CATV
  - Simplified Message Generation For Closed Circuit TV
  - Better Informed Conventions
  - Plus — Many Other Applications!
- BECAUSE Datavision Character Generators also offer these other important *instant information features* — Easy-to-Read Characters . . . Easy-to-Use Audio Tape Storage . . . Instant Keyboard Entry . . . Full Editing Controls . . . Keyboard-Controlled Word Flash . . . 2-Speed Horizontal Crawl . . . *And* They're Completely Portable and Computer-Compatible!

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DATAVISION INC. 2351 Shady Grove Road

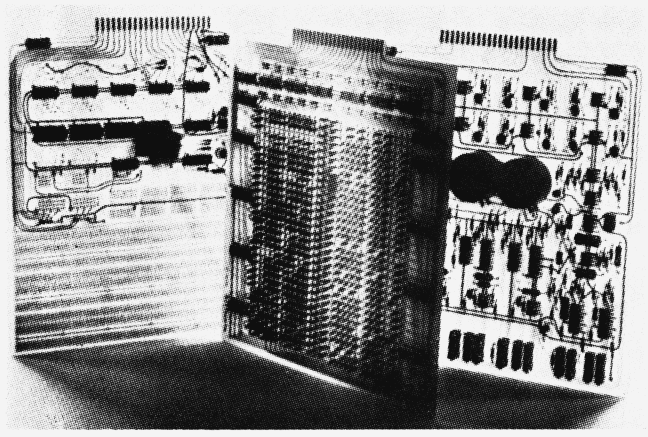
Rockville, Maryland 20850 — Telephone: (301) 948-0460

Circle 62 on Reader Service Card

New in Data . . .

Continued from previous page

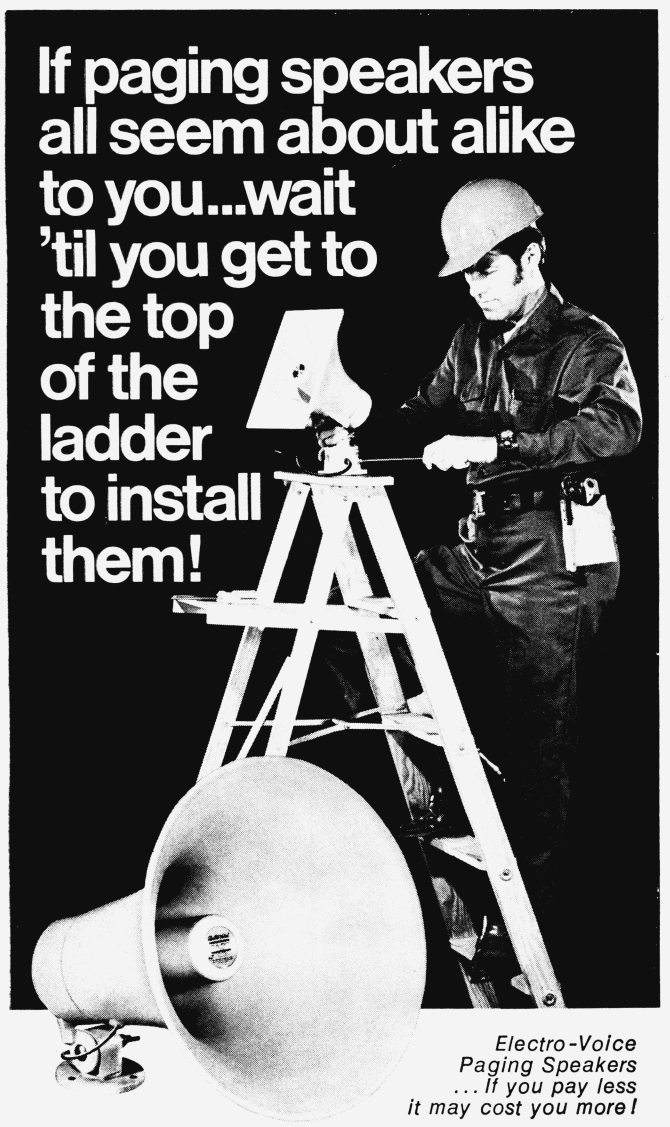
Voice Synthesizer



The lightweight (3 pounds), compact (10 inches by 4 inches by 11 inches) VOTRAX voice synthesizer converts digital commands into completely understandable English or into any language, if programmed for the purpose. Essentially, VOTRAX is an analog of the human vocal system, receiving the counterpart of voice signals to the larynx, and duplicating human speech through the utterance of the proper phonemes. Programming is accomplished through use of a keyboard. The basic library stored in ROM ranges anywhere from 100 to 500 words. Use card or write *Vocal Interface Division, Federal Screw Works, 3401 Martin Avenue, Detroit, Michigan 48210.*

Write in 360 on Coupon on page 71

If paging speakers all seem about alike to you...wait 'til you get to the top of the ladder to install them!



Electro-Voice Paging Speakers ... If you pay less it may cost you more!

How many trips up the ladder does it take you to finally install a paging speaker? (Be honest and include the times you drop hardware, and the extra trips to change level or positioning). Good news! E-V has made paging speaker installation easier and faster.

Now you need fewer tools and less time to get better sound. Speaker base removes for easy mounting, and it won't fall apart in your hands in the process. There are no screw terminals to short out, pigtails are already attached, no transformer cover plates to unscrew, and final speaker positioning is simple and positive.

All this and great sound in the bargain. Plus competitive prices on every model. More than a dozen from which to choose. Write today for our catalog or see your nearby Electro-Voice sound merchant.

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608 Cecil Street, Buchanan, Michigan 49107
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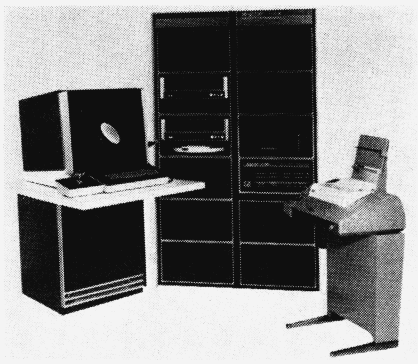
In Canada: EV of Canada, Ltd., Gananoque, Ontario

Electro-Voice®
a Gulton COMPANY

Circle 63 on Reader Service Card

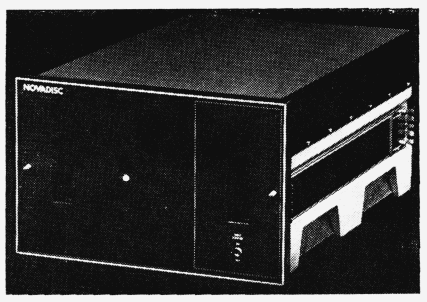
Graphics Terminal



The VECTORGRAPHICS II free-standing, interactive graphics terminal implements in hardware many display functions usually relegated to software. Such functions as scaling, rotating, and translating complex images in two or three dimensions are implemented by a single instruction change in memory. The basic unit uses a high-speed graphics display interfaced to a PDP-11 with 4K memory and ASR33 Teletype. Typical terminal configurations include a basic graphics system, multiple-monitoring and multiple-controller systems, and disk operating systems (DOS). Use card or write *Vector General, Incorporated, 8399 Topanga Canyon Boulevard, Canoga Park, California 91304.*

Write in 361 on Coupon on page 71

Fixed-Head Disk



A new fixed-head disk, called the Novadisc, is available with storage capacities of 128K, 256K, 512K, and 768K 16-bit words. The disk incorporates an air bearing that exerts two pounds of force on the read-write heads, and which tolerates up to four pounds of force, making the disks virtually immune to damage or data loss from typical bumps or vibrations. The Novadisc eliminates surface erosion and disk crashes with an automatic spring-loaded system that retracts the heads from the disk and locks them into position away from the recording surfaces. Use card or write *Data General Corporation, Route 9, Southboro, Massachusetts 01772.*

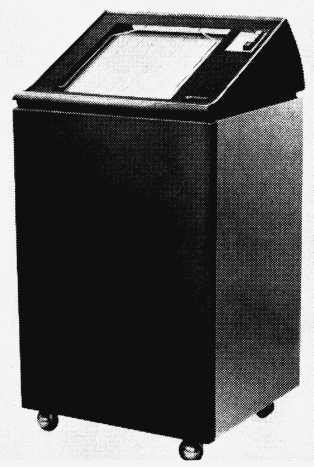
Write in 362 on Coupon on page 71

Cassette System

A new cassette-tape system provides RS-232 bit serial interface between data terminals and data-communications equipment operating in the synchronous mode. Designated the Minicette 2200, the cassette-drive system includes a controller and one bidirectional, dual differential capstan cassette transport with a speed of 5 in/s. The system's packing density is 800 6/in with an 8-bit character, and it has a read, write speed of 600 c/s. Use card or write *Cipher Data Products, 7655 Convoy Court, San Diego, California 92111.*

Write in 363 on Coupon on page 71

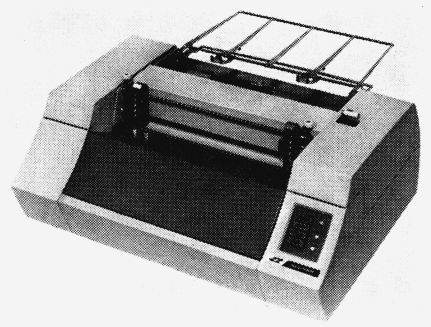
Matrix Printer



Two matrix printers, the LP-860 and the LP-1150, are based on the company's electrostatic writing technique and feature high-contrast printout and silent operation. The printers operate with computers and CRT terminals and can also be used in communications applications requiring fast (up to 9600 b/s) transmission rates. The LP-860 is an 80-column unit that prints 5 x 7 dot matrix characters at speeds up to 600 lines per minute on 8½-inch-wide paper. The LP-1150 is a 132-column printer which prints 7 x 9 dot-matrix characters at 500 lines per minute on 11-inch-wide paper. Use card or write *Versatec, Incorporated, 10100 Bubb Road, Cupertino, California 95014.*

Write in 364 on Coupon on page 71

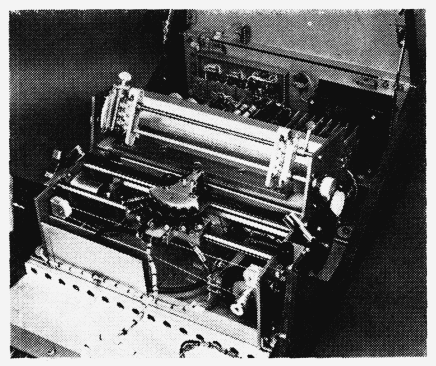
Printer



The SPD-P165 printer is designed to operate with the SPD 10/20 fully programmable CRT display terminal. The unit is self-contained, including all the electronics, line buffer, power supply, and vertical format control. It prints up to 165 c/s on standard paper, an original and up to four copies. The program within the SPD 10/20 can provide a separate terminal address and buffering for the printer. Character structure is a 5 x 7 dot matrix—10-point type equivalent. Use card or write *Incoterm Corporation, 6 Strathmore Road, Natick, Massachusetts 01760.*

Write in 365 on Coupon on page 71

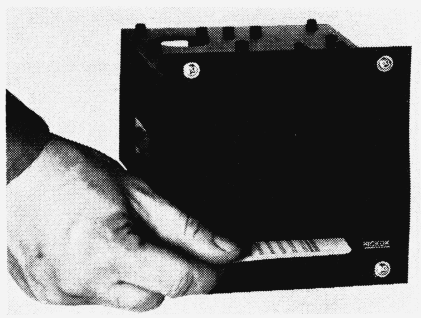
Teleprinter



The Series 9030 teleprinter uses a matrix impact printing technique, with operator-selectable print speeds of 10, 15, and 30 c/s. It offers ASCII upper and lower-case codes, half and full-duplex operation, odd and even parity, adjustable-width platens, the ability to handle six-part copy, and either an RS-232-C or a DTL/TTL 8-bit interface. The terminal includes an integral power supply, electronics, keyboard, and printer assemblies and is shipped from the factory ready to use. Use card or write *Di/An Controls, Incorporated, 944 Dorchester Avenue, Boston, Massachusetts 02125.*

Write in 366 on Coupon on page 71

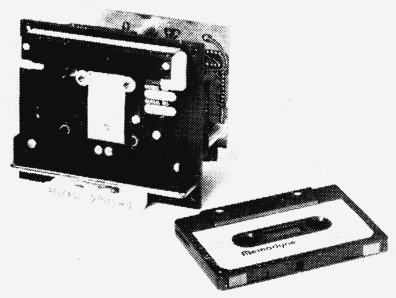
Card Reader



The Model 960A static card reader has a matrix of 12 rows by 80 columns for a 960-bit output. The continuous brush technique for reading the cards leads to more reliable operation and to long-term durability. Accurate readings are insured by using the multi-strand-type contacts. Three to five strands make electrical contact through each hole to a contact pad at all 960 positions. The Model 960A will tolerate misalignment of card holes in the horizontal direction up to 0.009 inch greater than the EIA specification. Use card or write *Instrumentation and Controls Division, The Hickok Electrical Instrument Company, 10514 Dupont Avenue, Cleveland, Ohio 44108.*

Write in 367 on Coupon on page 71

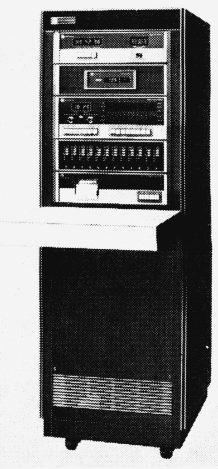
Recording System



The Series 201 cassette recording system provides compact data logging and storage for portable or remote applications. Using a stepping-motor drive, the Model 201 provides true incremental recording at a density of 615 b/in, yielding 2.214 million bits of storage on a single Phillips 300-foot cassette tape. The 201 uses CMOS logic for low power and high noise immunity. During recording the unit draws only 54 mA from the 12-V supply. Use card or write *Memodyne Corporation, 369 Elliot Street, Newton Upper Falls, Massachusetts 02164.*

Write in 368 on Coupon on page 71

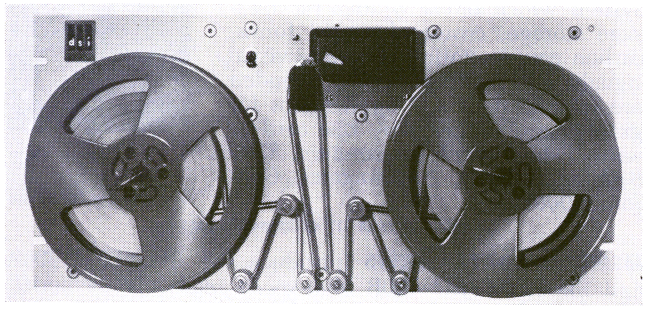
Surveillance Unit



A digital data surveillance facility scans, alarms, and/or logs inputs from as many as 576 sensors—emfs, thermocouple, or four-wire RTDs, single or dual range (automatically selected). Basically the facility consists of one or more input relay boxes, a scan controller, and a Numatron numeric display and printer for digital printout. The scan controller is readily programmed, by pushbutton selection, to provide a variety of functions. Twenty-four three-way rocker switches permit a choice of "skip", "scan", or "log" for as many as 24 banks of inputs (with 12 or 24 inputs per bank). Use card or write *Leeds & Northrup Company, Sumneytown Pike, North Wales, Pennsylvania 19454.*

Write in 369 on Coupon on page 71

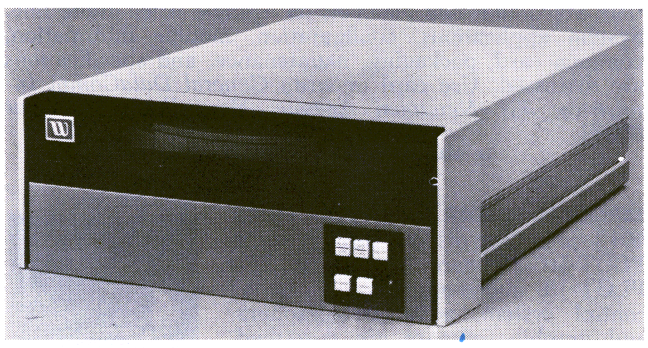
Paper-Tape Reader



The Type R-60B is a 60-c/s, bidirectional, paper-tape reader with spooling. The unit utilizes a noiseless, wear-free stepping motor to advance the tape and starwheels to sense the code holes. The R-60B reads 5, 6, 7, or 8-level tape without regard to color, thickness, or opacity. The reader may be used to program minicomputers, control N-C machines, program production-testing equipment, control plotting equipment, or transmit messages in data-communication systems. Use card or write *Data Specialties, 1548 Old Skokie Road, Highland Park, Illinois 60035.*

Write in 370 on Coupon on page 71

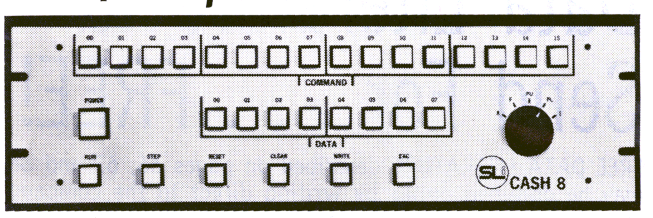
Magnetic-Disk Drive



A new magnetic-disk drive, designated the Series-F, utilizes the IBM 2315-type single-disk cartridge and an integral fixed disk. The heads are driven by a voice-coil linear positioner which provides a track-to-track access of 8 ms. The front-loading Series-F has a capacity of 24 million bits, and 48 million bits in the high-density version. Disk rotation speeds are 1500 or 2400 rpm. Use card or write *Wangco Incorporated, 2400 Broadway, Santa Monica, California 90404.*

Write in 373 on Coupon on page 71

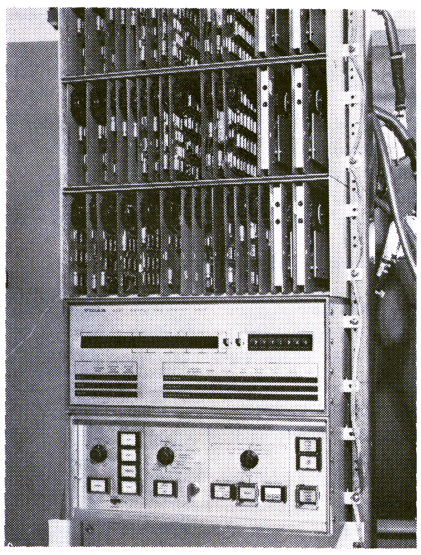
Computer/Controller



The 8-bit C•A•S•H-8 microprogrammable computer/controller offers a 16-bit microprogram instruction set with execution times of 200 ns. Over 53 instructions within five instruction classes are standard. The computer/controller is an ideal device for peripheral interfacing and dedicated applications, bridging the gap between chip level special-purpose hardwired controllers and general-purpose minicomputers. Other features include direct addressing to 65K words, 16 general-purpose programmable file registers, external priority interrupt system, input/output echo, and C-A•S•H-bus allowing for programmed I/O from any file register or memory. Use card or write *Standard Logic Incorporated, 1630 South Lyon Street, Santa Ana, California 92705.*

Write in 374 on Coupon on page 71

Message Meter



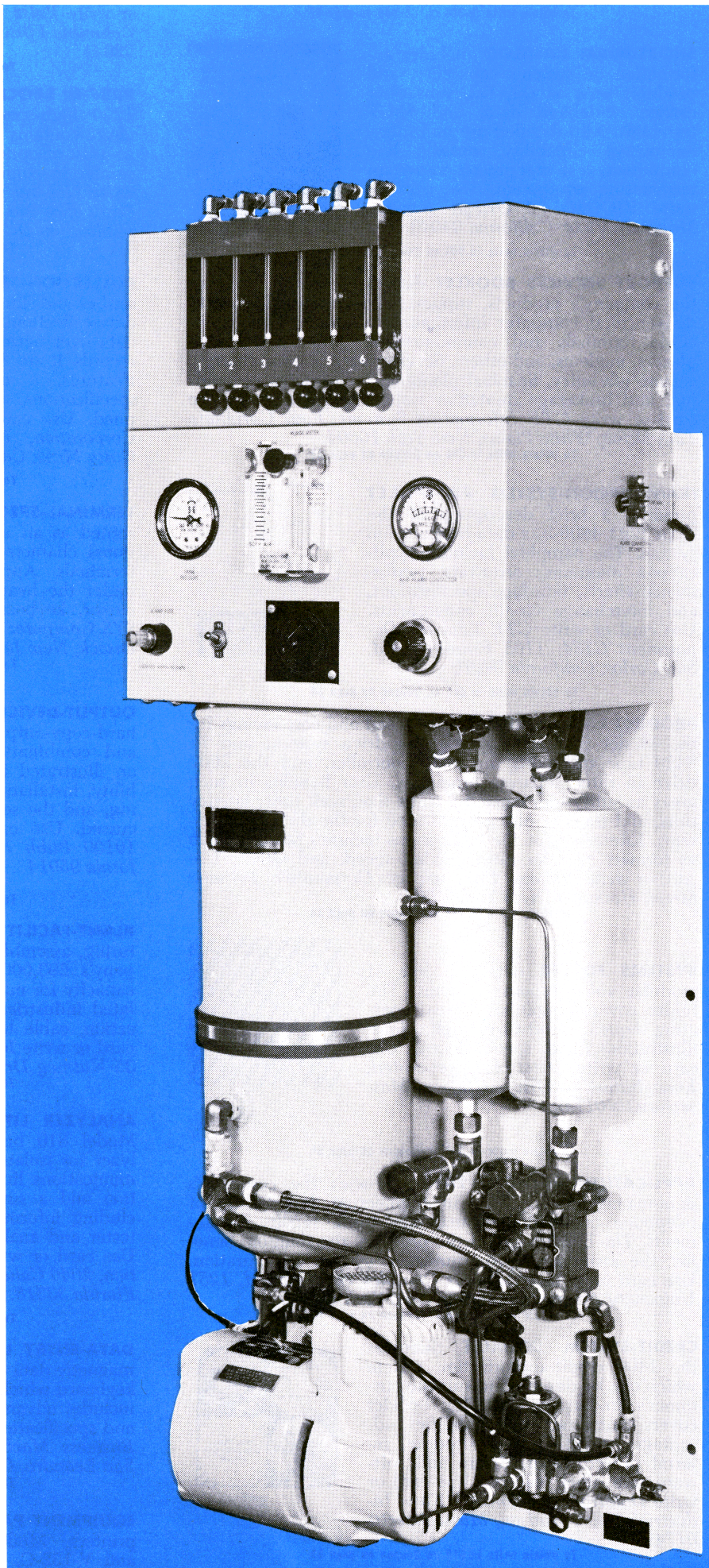
One 2900B local message-metering system will accommodate up to 46,000 subscriber lines via most common switching systems, including number 1 crossbar and panel. The local message-metering system is designed with a high degree of attenuation of longitudinal signals that permits undisturbed recording of data—electrical noises will not threaten the integrity of the data signal. The system, which operates on standard—48-V office battery power, automatically records the calling subscriber's directory number, zone called, call duration, and time of termination. Use card or write *VITEL, a Division of VIDAR Corporation, 77 Ortega Avenue, Mountain View, California 94040.*

Write in 371 on Coupon on page 71

Data System

The LCT Series data-collection and data-transmitting systems will operate off-line as well as on-line and can provide both punched-card and hard-copy output at the source for delayed transmission, subsequent recording, and audit trail purposes. The units have the capability to collect and record data at the source in both man- and machine-readable language and to transmit information on-line to a central data-processing operation. Transmission is in ASCII eight-level code. Use card or write *The Standard Register Company, Albany & Campbell, Dayton, Ohio 45401.*

Write in 372 on Coupon on page 71



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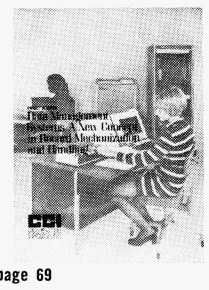
Data Literature to Send For . . . FREE!

FREE DATA LITERATURE described on pages 66, 67 and 68 may be obtained either by writing direct to the company and mentioning this item in "Communications News" or by writing in the number indicated on the coupon on page 69 and mailing it to us in your company envelope.

DATA COMMUNICATION BOOKLET—entitled "Sherry's Guide to Data Communication Buzz Words"—presents a humorous and informative list of data-communications words and definitions. A handy order form is included to send for other information on the company's data communication products. Use card or write *International Communications Corporation, 7620 Northwest 36th Avenue, Miami, Florida 33147.*

To obtain write in 501 on Coupon on page 69

DATA-SYSTEMS BOOKLET covers direct-access data management systems—a new concept in record mechanization and handling. Communications capability for remote file access is also discussed, plus operation information. Use card or write *Computer Consoles, 1257 University Avenue, Rochester, New York 14607.*

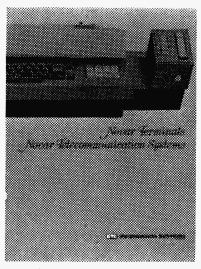


To obtain write in 502 on Coupon on page 69

REMOTE-TERMINALS LITERATURE discusses a remote job entry terminal system to communicate with HASP-run System/360 or System/370 computers. Features, operation, and a photograph are included. A data sheet discussing unattended terminals for remote job entry is also available. Use card or write *The Singer Company, Business Machines Division, 2350 Washington Avenue, San Leandro, California 94577.*

To obtain write in 503 on coupon on page 69

TERMINALS LITERATURE describes and illustrates terminals and telecommunication systems. Brief specifications and a photograph are provided for each model. Information on accessories, systems capability, and nationwide service is also included. Use card or write *GTE Information Systems, Novar Corporation, 2370 Charleston Road, Mountain View, California 94040.*

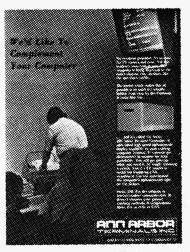


To obtain write in 504 on Coupon on page 69

TROUBLESHOOTING GUIDE describes a whole family of logic probes, logic pulsers, logic clips, logic comparators, and accessories, and gives specifics on how to cut downtime by fast, on-the-spot in-circuit troubleshooting. The guide details options, accessories, typical operation, and specifications. Illustrations are also included. Use card or write *Hewlett-Packard Company, 1501 Page Mill Road, Palo Alto, California 94304.*

To obtain write in 505 on Coupon on page 69

APPLICATION NOTE illustrates educational applications for the Series 200 CRT terminals, plus compatible free-standing keyboards and monitors. A specification table detailing the Model 204, Model 206, and the Model 208 terminals is also included. Use card or write *Ann Arbor Terminals, 6107 Jackson Road, Ann Arbor, Michigan 48103.*



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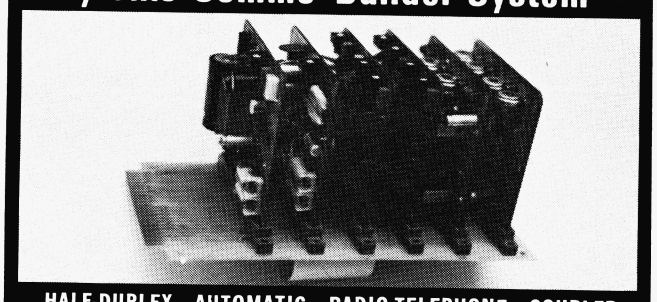

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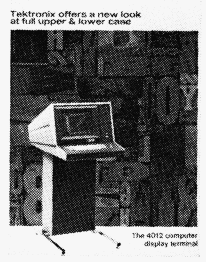
TERMINAL DATA SHEET features the GDC 1300 Series speech-plus terminal which permits interference-free use of both voice and data channels on a single voice-grade line. System applications, configuration, module information, common card, packaging, maintenance, and specifications are discussed. Use card or write *General DataComm Industries, 537 Newtown Avenue, Norwalk, Connecticut 06851.*

To obtain write in 506 on Coupon on page 69

TERMINAL FOLDER features the Model 4012 computer display terminal with PLOT-10 software support. The PLOT-10 minicomputer, terminal control system, advanced graphing, and graphic software are described. Specifications are also supplied. Use card or write *Tektronix, Post Office Box 500, Beaverton, Oregon 97005.*



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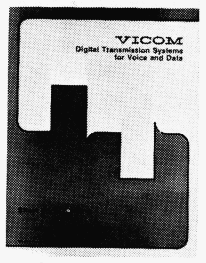
EQUIPMENT CATALOG presents the 2200 business minicomputer, communications adaptors, tape drives, a disk system, a serial printer, a line printer, a card reader, Selectric interface, interactive terminal, tape unit, display unit, and other equipment. An illustration of each product is included, with complete specifications and features. Use card or write *Computer Terminal Corporation, 9725 Datapoint Drive, San Antonio, Texas 78284.*

To obtain write in 508 on Coupon on page 69

SHORT-FORM CATALOG includes information on systems capability, and products such as D1, D2, subscriber carrier, wideband data, and SM-T terminals. Also detailed are multiplex-microwave capability, outside line equipment, test equipment, and span terminating equipment. Use card or write *VICOM, 77 Ortega Avenue, Mountain View, California 94040.*

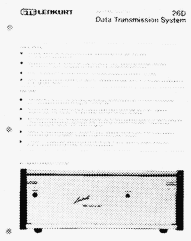


To obtain write in 509 on Coupon on page 69

SUPPORT SERVICES BOOKLET discusses the full range of the company's products, support, and services needed to deliver total computer information systems. Products include terminals and communications processors, multiplexers, modems, and others. Services such as time sharing, remote job entry, financial planning, credit-union accounting, and brokerage quotation systems are discussed. Use card or write *GTE Information Systems, Four Corporate Park Drive, White Plains, New York 10604.*

To obtain write in 510 on Coupon on page 69

TRANSMISSION-SYSTEM PAMPHLET provides a brief description of the Type 26D 4800-b/s data-transmission system. The pamphlet includes applications diagrams, error-rate performance charts, interface specifications, and interchange circuit assignments. Use card or write *GTE Lenkurt, Department C134, 1105 County Road, San Carlos, California 94070.*



To obtain write in 511 on Coupon on page 69

PRODUCT LITERATURE describes speed and cost savings for the Model 2900/2800/2500 disk-drive systems and its 8420 tape transport, the 8803 controller, and the 2007 drive in three separate brochures. User benefits in such areas as subsystem capacity, track size, seek time, latency time, and transfer rate are provided for the disk-drive systems. Literature for the other items includes features such as formats, transfer rates, rewind speed, and others. Use card or write *Mohawk Data Sciences Corporation, Palisade Street, Herkimer, New York 13350.*

To obtain write in 512 on Coupon on page 69

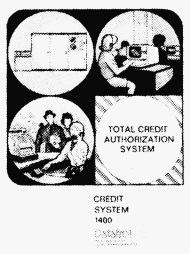
SYSTEMS FOLDER details a line of modular voice-response systems. The folder covers operation, typical operating sequence, software, applications, illustrations, and specifications. Use card or write *Datatrol Incorporated, Kane Industrial Drive, Hudson, Massachusetts 01749.*

To obtain write in 513 on Coupon on page 69

APPLICATION BULLETIN 2052 discusses the company's data-management systems in engineering departments of telephone companies to maintain trunk facility assignments. The bulletin covers the problem, the solution, benefits, the assignment procedure, and system configuration. Use card or write *Computer Consoles Incorporated, 1257 University Avenue, Rochester, New York 14607.*

To obtain write in 514 on Coupon on page 69

CREDIT-SYSTEM BOOKLET discusses the 1400 credit-authorization system which can be designed to suit the customer's requirements. The booklet covers configurations, capabilities, advantages, point-of-sale procedure, referral procedure, hardware and software, and other features. Use card or write *Datatrol Incorporated, Kane Industrial Drive, Hudson, Massachusetts 01749.*



To obtain write in 515 on Coupon on page 69

COMPUTER BROCHURE contains details on the 24-bit DC 6024/5 computer with information on input/output, I/O transfer, operator's display and control console, and the CPU. Other information includes a description of the DC 6024/5 system configuration, software, and technical specifications. Use card or write *Datacraft, 1200 Northwest 70th Street, Fort Lauderdale, Florida 33307.*

To obtain write in 516 on Coupon on page 69

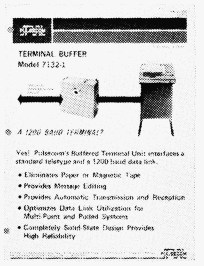
SYSTEM BOOKLET features the Telescriber handwritten communication system which offers winder for message storage, custom-designed forms, carbon copies, station selection, visual signals, and audible signals. Included are specifications and applications for graphic communications. Use card or write *Telautograph Corporation, 8700 Bellanca Avenue, Los Angeles, California 90045.*

To obtain write in 517 on Coupon on page 69

MEMORIES DATA SHEETS introduce the ROMTEC 200A and the ROMTEC 450B high-speed read-only memories. The 200A has an access time of 150 ns and cycle time of 200 ns in 24,576-bit configuration. The 450B has an access time of 180 ns and cycle time of 450 ns in configuration of 196,608 bits. Other features and specifications, plus prices, are included. Use card or write *Aztec Data Systems, 17805 Sky Park Circle, Suite E, Irvine, California 92707.*

To obtain write in 518 on Coupon on page 69

BUFFER FOLDER discusses the Model 7132-1 terminal buffer which interfaces a standard Teletype teleprinter and a 1200-baud data link. The folder covers operation, message preparation, message editing, transmission and reception, and specifications. Use card or write *Pulse Communications, 5714 Columbia Pike, Falls Church, Virginia 22041.*



To obtain write in 519 on Coupon on page 69

PRINTER BROCHURE describes and illustrates the TermiNet 1200 high-speed data-communication printer. The brochure contains information on the 1200-c/s printer as well as a list of optional equipment available to supplement the printer in communication systems operation. Use card or write *General Electric Communication Systems Division, Post Office Box 4197, Lynchburg, Virginia 24502. (Request publication DCP-1100.)*

To obtain write in 520 on Coupon on page 69

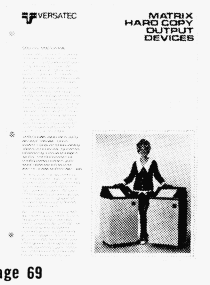
COLLECTION-STATION SHEET describes and illustrates the Model 3020 data-collection station which receives data over normal telephone lines and records it on ½-inch magnetic tape. Features, a configuration diagram, specifications, and options are supplied. Use card or write *MSI Data Corporation, 1381 Fischer Avenue, Costa Mesa, California 92627.*

To obtain write in 521 on Coupon on page 69

TERMINAL-SPECIFYING AID is a four-page brochure designed as an aid in determining the physical and functional characteristics for the company's tailor-made CRT terminals. Approximately 200 characteristics are listed under the headings of general, display, character codes, cursor, keyboard layout, and others. Use card or write *SYS Computer Corporation, 17-25 DiCarolis Court, Hackensack, New Jersey 07601.*

To obtain write in 522 on Coupon on page 69

OUTPUT-DEVICES FOLDER features hard-copy-output printers, plotters, and combination printer/plotters in an illustrated folder. Software, reliability, installation and operation, leasing, and the service program are discussed. Use card or write *Versatec, 10100 Bubb Road, Cupertino, California 95014.*



To obtain write in 523 on Coupon on page 69

PLANT-FACILITY BOOKLET describes advanced manufacturing, assembly, and quality-control facilities of the company's 293,000-square-foot plant. The plant has present capacity for major subcontract production for EDP and related industries in wire-wrap, printed-circuit-board fabrication, cable harness, and sub and main assemblies. Use card or write *Bunker Ramo Corporation, Department IPD, 35 Nutmeg Drive, Trumbull, Connecticut 06609.*

To obtain write in 524 on Coupon on page 69

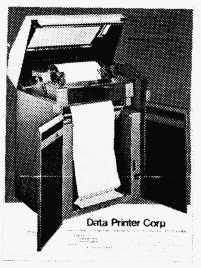
ANALYZER LITERATURE features the Model 810 bisync line control analyzer for isolating faults in data-communications links. A general description and a summary of features including information on the interface tester and analog tester are supplied. Use card or write *Paradyne Corporation, 2040 Calumet Street, Clearwater, Florida 33518.*

To obtain write in 525 on Coupon on page 69

DATA-ENTRY UNITS BULLETIN features the Models 4321 magnetic data recorder and the Model 4322 magnetic data keyboard which both offer a 49-key keyboard. The bulletin includes advantages, a photograph, and complete features and specifications. Use card or write *The Singer Company, Business Machines Division, 2350 Washington Avenue, San Leandro, California 94577.*

To obtain write in 526 on Coupon on page 69

EQUIPMENT PAPER presents a line of printers, Models F-80-C, F-132-C, and V-132-C, which features a 600-l/m printer mechanism, a single-line memory, eight-channel vertical-format unit, and a universal interface. Specifications and options are discussed. Use card or write *Data Printer Corporation, 201 Vassar Street, Cambridge, Massachusetts 02139.*

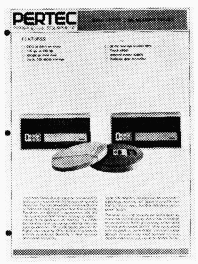


To obtain write in 527 on Coupon on page 69

EQUIPMENT HANDBOOK covers the DMS 500 digital-readout system, a 50-microinch system for laboratory and machine tool application, counters, scales, and mounting hardware. Application notes covering such items as choosing the location for the transducer and scale mounting techniques are presented. Numerous illustrations and diagrams are also included. Use card or write *Dynamics Research Corporation, 50 Concord Street, Wilmington, Massachusetts 01887.*

To obtain write in 528 on Coupon on page 69

MEMORY DRIVES BULLETIN provides a detailed description of the D-3000 Series disk memory drives available in single or dual disk versions, on both top and front loading configurations, 2315 or 5440 cartridges. Contained in the bulletin are interface descriptions and specific input/output lines. Use card or write *Pertec Corporation, Department D-3000, 9600 Irondale Avenue, Chatsworth, California 91311.*



To obtain write in 529 on Coupon on page 69

CARD-READER-SYSTEM BROCHURE presents a card-reader system which permits reading data from punched cards into Micro 800 and Micro 1600 computers. The brochure describes the controller, card reader, and software in detail. Photographs and diagrams illustrate functional characteristics, data flow, and the physical packaging of the system. Use card or write *Microdata Corporation, 644 East Young Street, Santa Ana, California 92705.*

To obtain write in 530 on Coupon on page 69

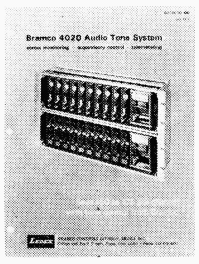
TERMINAL BROCHURE presents the Source 2100 portable data terminal for a variety of retailing, manufacturing, and accounting applications where data is collected from a number of remote locations and sent to a data center. The brochure includes features, specifications, and options. Use card or write *MSI Data Corporation, 1381 Fischer Avenue, Costa Mesa, California 92627.*

To obtain write in 531 on Coupon on page 69

COMMUNICATIONS-TERMINAL BROCHURE features the Model 2775 intermediate-speed data-communications terminal consisting of a card reader, control electronics, and a free-standing line printer. Communication interface, line buffer, message format, off-line capability, line printer, card reader, applications, and operation are discussed. Use card or write *SCS-Remcom Corporation, 2705 National Drive, Garland, Texas 75041.*

To obtain write in 532 on Coupon on page 69

TONE-SYSTEM MANUAL discusses cost-saving tips that should be considered before designing any control or monitoring system. The catalog contains complete specifications and highlights of the various stock AM tone transmitters, receivers, power supplies, and mounting hardware needed to build systems. Use card or write *Bramco Controls Division, Ledex Incorporated, College and South Streets, Piqua, Ohio 45356.*



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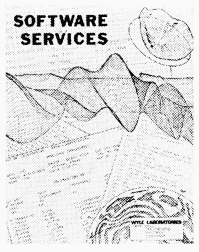
INSTRUMENT BULLETIN discusses the CorPak 8 expansion core-memory system for PDP-8/I minicomputer users offering up to 28K by 12 bits of expansion memory in 4K by 12-bit increments. Construction, maintenance, service, specifications, and features are listed. Use card or write *Information Control Corporation, 9610 Bellanca Avenue, Los Angeles, California 90045.*

To obtain write in 534 on Coupon on page 69

SOFTWARE-SERVICES BOOKLET describes the company's computer-system services. Environmental testing, instrumentation, computerized data acquisition and control system design, and software development are discussed in brief along with additional information on analytical and business software. Use card or write *Wyle Laboratories, 3200 Magruder Boulevard, Hampton, Virginia 23366.*



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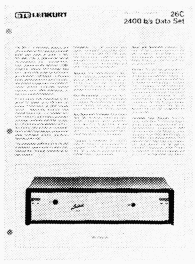
PRODUCT BROCHURE describes and illustrates the Model 7103G data set for 300-b/s automatic answer and originate operation with CBT or CBS data coupler. The brochure covers a functional description, physical configurations, specifications, and options. Use card or write *Tele-Dynamics Division, AMBAC Industries, 525 Virginia Drive, Fort Washington, Pennsylvania 19034.*

To obtain write in 536 on Coupon on page 69

DATA-SET BROCHURE features the Type 26C data set which processes serial digital data at speeds of 150, 300, 600, 1200, and 2400 b/s over a standard 3002 unconditioned voice-grade telephone circuit. A brief description of the Duobinary technique, transmission requirements, specifications, and other pertinent information are included. Use card or write *GTE Lenkurt, Department C720, 1105 County Road, San Carlos, California 94070.*



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SYSTEM FOLDER presents a line of data-processing building blocks and systems for minicomputer applications—Nova, Supernova, PDP-8, 11, H-316, 516, HP2100, and Varian 620. The folder includes a brief description of each system, plus an illustration. Use card or write *Peripheral Data Machines, 102 New South Road, Hicksville, New York 11801.*

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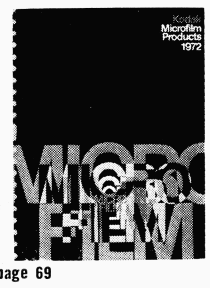
MICROFILM PRODUCTS BOOKLET contains details on microfilmers, microfilm readers and accessories, reader/printers, processing equipment and accessories, and microfilm magazines. Illustrations and specifications are presented on all models. Use card or write *Eastman Kodak Company, 343 State Street, Rochester, New York 14650.*



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APPLICATION PAPERS cover applications using the company's plotters. Topics include: computer service graphics help integrate architectural process; East Ohio Gas Company leads system in computer graphics; plotting helps Danly Machine Corporation diversify; plotting cuts costs, improves drawings at G.E. Rome; Comp-Tech provides unique service to photogrammetrists; and Cities Service plotting requires two systems. Use card or write *California Computer Products, 2411 West La Palma Avenue, Anaheim, California 92801.*

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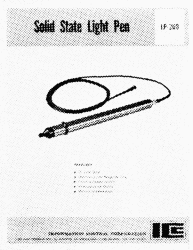
LIGHT-PEN BULLETIN details the Model LP-200 solid-state light pen with less than 3-μs response time. The bulletin covers optical receiver, processing electronics, touch-sensitive actuator, response, resolution, output, and specifications. Use card or write *Information Control Corporation, 1320 East Franklin Avenue, El Segundo, California 90245.*



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COLLECTION-SYSTEM MANUAL details a complete source-data collection system. The system is described in 12 sections, each of which details, where applicable, the unit's construction, assembly details, life expectancy, pricing, and major features. Complete specifications and illustrations are also provided. Use card or write *Mohawk Data Sciences Corporation, Colorado Instruments Division, Broomfield, Colorado 80020.*

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PRODUCT BROCHURE features the Model 1500 credit-authorization system providing high-speed authorization for all good accounts and complete credit histories to authorizers on questionable accounts. Features, benefits, and applications are discussed. Use card or write *Datatrol Incorporated, Kane Industrial Drive, Hudson, Massachusetts 01749.*

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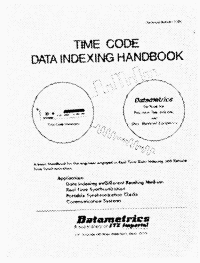
APPLICATIONS NOTE demonstrates the use of the CD4007A COS/MOS dual complementary pair plus inverter as the D/A switch and op-amp output stage for a low-power DAC. The note includes information on using the CD4007A COS/MOS IC, such as general considerations, resistance networks for DACs, and other pertinent information. Use card or write *RCA Solid State Division, Post Office Box 3200, Somerville, New Jersey 08876.*

To obtain write in 544 on Coupon on page 69

INDEXING HANDBOOK presents a technical dissertation on the theory of data indexing and retrieval on different recording mediums such as magnetic tape, oscillographs, strip-chart recorders, and camera film. A summary of available time-code formats and their application is also supplied. Use card or write *Datametrics, 127 Coolidge Hill Road, Watertown, Massachusetts 02172.*



To obtain write in 545 on Coupon on page 69

COMPONENT-RECORDERS LITERATURE describes and illustrates the "Flying Spot" component recorders for pattern, plot, or picture form. The literature contains complete specification information. Featured applications contained in the literature include frequency spectrum analysis. Use card or write *Alden Electronic & Impulse Recording Equipment Company, Alden Research Center, Westboro, Massachusetts 01581.*

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APL SYSTEM BROCHURE describes and illustrates the Model 4013 APL graphics system with full ASCII combined with full APL symbol set offering 188 printing characters. Functional capabilities, a discussion of APL, specifications, and service are discussed. Use card or write *Tektronix, Post Office Box 500, Beaverton, Oregon 97005.*

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DISPLAY-TERMINAL BROCHURE describes and illustrates the Vistar stand-alone alphanumeric display designed for both buffered (block) or unbuffered (character) data transmission. The brochure covers display characteristics, modes of operation, command functions, interface, keyboard, and code set. Use card or write *Infoton Incorporated, Second Avenue, Burlington, Massachusetts 01803.*

To obtain write in 548 on Coupon on page 69

DATA-SET SHEET presents the Model 113/87 data set which may be utilized as either a direct-access data set or with adapters as an acoustic coupler. Features, illustrations, a general description, and specifications are supplied. Use card or write *MI² Data Systems, Design Elements Division, 1356 Norton Avenue, Columbus, Ohio 43212.*

To obtain write in 549 on Coupon on page 69

SYSTEMS HANDBOOK features the Datapoint 2200 business minicomputer. The handbook contains information on source data entry and communications, typical source data entry applications, a multiuse terminal, remote preprocessing, instrumentation interface, hardware and peripheral descriptions, software, user training, systems support, and field service. Use card or write *Computer Terminal Corporation, 9725 Datapoint Drive, San Antonio, Texas 78284.*

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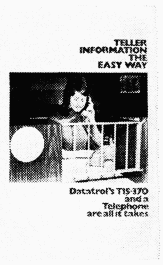
SYSTEM GUIDE describes and illustrates the TIS-370 computerized teller information system that talks to tellers over standard telephones. Capabilities, turn-key installation, how it works, specifications, and advantages are provided. Use card or write *Datatrol Incorporated, Kane Industrial Drive, Hudson, Massachusetts 01749.*



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DIGITAL TAPE-RECORDING BOOKLET is an introduction to digital magnetic-tape recording. The booklet is divided into five main sections including digital tape-recording technique, organization of data on magnetic tape, punched-tape formats and standard interchange codes, magnetic tape in the computer environment, and care of magnetic tape. Numerous illustrations are provided. Use card or write *The Singer Company, Business Machines Division, 2350 Washington Avenue, San Leandro, California 94577.*

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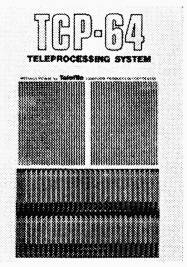
SYSTEM BULLETIN details the TCP-64 teleprocessing system which utilizes common-carrier communications facilities for a variety of digital communications applications. Complete details of the system components and block diagrams of several major configurations are also included. Use card or write *Telefile Computer Products, 17785 Sky Park Circle, Irvine, California 92664.*



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INTERCEPT APPLICATION BROCHURE 2050 describes the problem and solution of the intercept operation within the traffic department. The benefits of the company's direct-access data management system are also discussed. Updating the file and the system configuration are covered in the brochure. Use card or write *Computer Consoles Incorporated, 1257 University Avenue, Rochester, New York 14607.*

To obtain write in 554 on Coupon on page 69

PENS FOLDER details the Models LP-301 and LP-302 light pens featuring less than 300-ns response time, touch-actuated switch, and a finder beam. A general description, features, illustrations, and specifications are supplied. Use card or write *Information Control Corporation, 1320 East Franklin Avenue, El Segundo, California 90245.*

To obtain write in 555 on Coupon on page 69

MODEMS PAMPHLET presents the GDC 201 Series of modems which are four-phase, phase-shift modulated, synchronous sets designed to operate at 2000 or 2400 b/s. Features, application, diagnostics, operating features, specifications, and ordering information are discussed. Diagrams are also included. Use card or write *General DataComm Industries, 537 Newtown Avenue, Norwalk, Connecticut 06851.*

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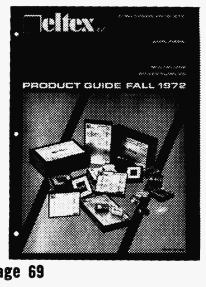
More Data Literature . . .

Continued from previous page

TERMINAL BOOKLET details the general functional and physical characteristics of the Model 4780 stored-program terminal. An overview of the hardware and a general description of system operation is included. Specific operating sequences are application-dependent and are described by the application program descriptions. Use card or write *SCS-Remcom Corporation, 2705 National Drive, Garland, Texas 75041.*

To obtain write in 557 on Coupon on page 69

PRODUCT GUIDE describes linear products, data-conversion modules, multi-channel A-D coversion system, and power-supply modules. All pertinent electrical and mechanical specifications, as well as photos, product descriptions, and diagrams are included. Use card or write *Zeltex Incorporated, 1000 Chalomar Road, Concord, California 94520.*



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COMPUTER-SYSTEM MANUAL describes the 6140 mission-matched computer system in detail including ways in which the system performs concurrent real-time and background batch processing. The manual details hardware and software features, real-time applications, systems capabilities, a full range of available peripherals, and the system instruction set. Use card or write *EMR Computer, 8001 Bloomington Freeway, Minneapolis, Minnesota 55420.*

To obtain write in 559 on Coupon on page 69

COUPLERS FOLDER presents the Design 76 acoustic couplers available as either originate-only or originate and answer models with data speeds up to 300 baud. Illustrations, specifications, operator controls, and features are listed. Use card or write *MI²Data Systems, Design Element Division, 1356 Norton Avenue, Columbus, Ohio 43212.*

To obtain write in 560 on Coupon on page 69

MANAGEMENT-SYSTEMS BOOKLET presents the magnetic-tape data-management systems and their applications in record mechanization. The system concept, circuit-layout records, advantages, system flexibility, and applications in other areas are discussed. Use card or write *Computer Consoles Incorporated, 1257 University Avenue, Rochester, New York 14607.*

To obtain write in 561 on Coupon on page 69

INSTRUMENT BROCHURE discusses the Model CS-1400 stand-alone voice-response system for many data entry and retrieval applications. Information on features, configurations, capabilities, components, software, and specifications is provided. Use card or write *Datatrol Incorporated, Kane Industrial Drive, Hudson, Massachusetts 01749.*

To obtain write in 562 on Coupon on page 69

SYSTEM LITERATURE describes and illustrates the ComRac 50 field-expandable commercial random-access core-memory system with a 1.5-μs full-cycle time, 350-ns access time, and capacity up to 32K by 18 bits. Features, power requirements, specifications, an illustration, and options are supplied. Use card or write *Information Control Corporation, 9610 Bellanca Avenue, Los Angeles, California 90045.*

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(Fig. B) Turn

(Fig. C) Pull

(Fig. D— end result)

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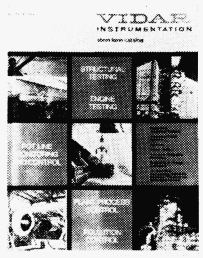
5. Turn tool circularly (complete turn—Fig. B) then pull for longitudinal cut (Fig. C).
6. Remove insulation from cable (Fig. D/end result).

Circle 67 on Reader Service Card

COMMUNICATIONS SERIES LITERATURE describes the Model 310 Series of data-communications terminals, featuring the Model 4311 magnetic data recorder. Advantages, communications capability, transmission speeds, terminal operations, polling and selection capabilities, on-line and off-line printing, and other features are discussed. Use card or write *The Singer Company, Business Machines Division, 2350 Washington Avenue, San Leandro, California 94577.*

To obtain write in 564 on Coupon on page 69

INSTRUMENTS CATALOG includes information on IDVMs, scanners, digital clocks, digital data-acquisition systems, voltage-to-frequency and frequency-to-voltage converters, and FM recording, reproducing automatic readiness checking and calibration systems. Digital and FM data-acquisition system capabilities are described. Use card or write *VIDAR Corporation, 77 Ortega Avenue, Mountain View, California 94040.*



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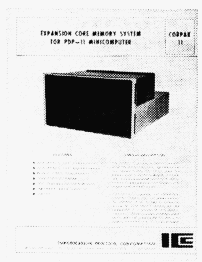
MULTIPLEXER FOLDER describes and illustrates the GDC 1100 Series frequency-division multiplexer with 16 channels per standard shelf and Analoop and Dataloop test features. The folder discusses other features, configurations, packaging, single-channel subset, maintenance, and specifications. Use card or write *General DataComm Industries, 537 Newtown Avenue, Norwalk, Connecticut 06851.*

To obtain write in 566 on Coupon on page 69

CORE-MEMORY SHEET presents the CorPak 11 expansion core-memory system for PDP-11 minicomputers. A general description, features, construction, maintenance, service, and specifications are discussed. Use card or write *Information Control Corporation, 9610 Bellanca Avenue, Los Angeles, California 90045.*



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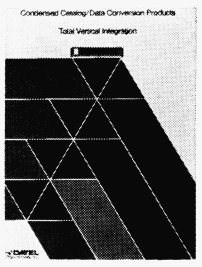
EQUIPMENT FOLDER describes and illustrates the Model 2780 medium-speed data-communications terminal consisting of a line printer, card reader, control electronics, and a communications line interface packaged in a single cabinet. The folder covers features, line buffer, message format, operation, specifications, and applications. Use card or write *SCS-Remcom Corporation, 2705 National Drive, Garland, Texas 75041.*

To obtain write in 568 on Coupon on page 69

A/D-D/A CATALOG contains detailed electrical and mechanical information on ultraminiature A/D and D/A converters, plus accessory operational amplifiers, sample-and-hold amplifiers, analog multiplexers, miniature DC power supplies, plus a line of modular and rack-mount data acquisition systems. Use card or write *Datel Systems, 1020 Turnpike Street, Canton, Massachusetts 02021.*



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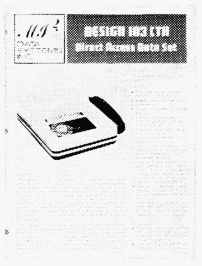
COMMUNICATIONS-COSTS BULLETIN describes two safe and simple ways to cut computer communications costs. The two-color bulletin presents a full discussion on how multiplexing—especially time-division multiplexing—can be employed by large communications users to cut phone-line transmission costs. Use card or write *Infotron Systems Corporation, 7300 North Crescent Boulevard, Pennsauken, New Jersey 08110.*

To obtain write in 570 on Coupon on page 69

DATA SET PAMPHLET describes and illustrates the Model 103 CTH direct-access data set for the purpose of transmitting and receiving serial, binary, asynchronous data at speeds up to and including 300 baud. The pamphlet covers standard and optional features, specifications, and an interface wiring diagram. Use card or write *MI² Data Systems, Design Elements Division, 1356 Norton Avenue, Columbus, Ohio 43212.*



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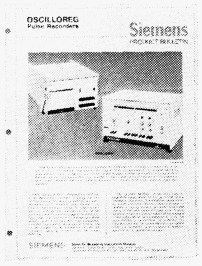
LINE-PRINTER FOLDER describes and illustrates the Model 200 line printer, a 132-column unit that prints at 200 l/m with a 64-character font. Included in the folder are detailed specifications on font sets and codes; the use of the multifont buffer and font belt to provide increased speed, interface information, and forms-handling capabilities. Use card or write *Iomec Incorporated, Digitronics Division, Route 9, Southboro, Massachusetts 01772.*

To obtain write in 572 on Coupon on page 69

PULSE-RECORDER BULLETIN describes the Oscilloreg line of AC and DC pulse recorders which includes the Model M02001 and the Model M02627. Operating functions on both models are remotely controllable. Other features, applications, and technical data and specifications are presented. Use card or write *Siemens Corporation, 186 Wood Avenue South, Iselin, New Jersey 08830.*



To obtain write in 573 on Coupon on page 69

DATA-SET LITERATURE features the Model 7103F data set with full-duplex operation at 300-b/s manual originate/answer. Included in the literature are physical configurations, operation, test features, illustrations, specifications, and ordering formation. Use card or write *Tele-Dynamics Division, AMBAC Industries, 525 Virginia Drive, Fort Washington, Pennsylvania 19034.*

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PRINTER DATA SHEET features the Model 236 and the Model 306 printers with 132 columns per line and 64 characters per column. The Model 236 prints a full line at 200 l/m, while the Model 306 prints a full line at 300 l/m. Other features, specifications, and options are presented. Use card or write *Data Printer Corporation, 201 Vassar Street, Cambridge, Massachusetts 02139.*

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PLANET-SERVICE PAMPHLET describes the PLANET Service, an important new approach in computerized network design and system planning. The pamphlet discusses basic components, application, and features such as cost-effective consideration. Use card or write *Berglund Associates, 1060 North Kings Highway, Suite 212, Cherry Hill, New Jersey 08034.*

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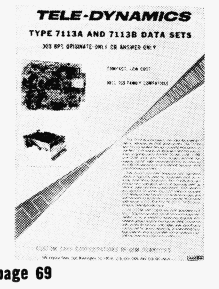
DATA-SETS BROCHURE describes and illustrates the Type 7113A and 7113B data sets for OEM applications. The brochure covers general information, telephone-line interface, data access arrangement interface, data-terminal interface, input power, configurations, and requirements. Use card or write *Tele-Dynamics Division, 525 Virginia Drive, Fort Washington, Pennsylvania 19034.*



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MODEM DATA SHEET describes the Model 2010, a Bell 201B compatible modem capable of synchronous operation at 2400 b/s. Included in the data sheet are descriptions of important features, detailed theory of operation, and complete technical specifications. Use card or write *Intertel, 6 Vine Brook Park, Burlington, Massachusetts 01803.*

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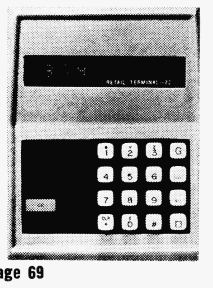
TERMINAL PAMPHLET describes and illustrates the retail terminal-22 for automatic authorization, check-cashing authorization, bank-card authorization, and other uses. A brief discussion of the company is also included. Use card or write *Datatrol Incorporated, Kane Industrial Drive, Hudson, Massachusetts 01749.*



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RECORDER DATA SHEET describes and illustrates the Model 4301 magnetic data recorder with a 49-key keyboard for recording on 7- or 9-track magnetic tape. The data sheet contains facts about the recorder, an illustration, optional features, and other units in the 4300 magnetic data recording system. Use card or write *The Singer Company, Business Machines Division, 2350 Washington Avenue, San Leandro, California 94577.*

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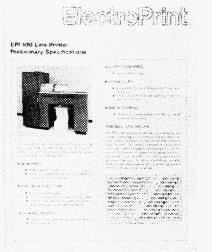
LINE-PRINTER BULLETIN describes and illustrates the EPI-100 line printer for 8,000-l/m printing. A general description, a photograph, features, specifications, and a typical print sample printed at a 1:1 ratio are supplied. Use card or write *ElectroPrint, 10061 Bubb Road, Cupertino, California 95014.*



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GRAPHICS-TERMINALS BULLETIN features a new line of free-standing interactive graphics terminals, Vectorgraphics II, designed for the end-user and featuring hardware/software, a variety of configurations, and complete software packages. Illustrations are also supplied. Use card or write *Vector General, 8399 Topanga Canyon Boulevard, Canoga Park, California 91304.*

To obtain write in 582 on Coupon on page 69

PRODUCT CATALOG contains a brief description of the company, specifications on typical magnetic-tape input/output systems, digital cassette drives, and mass memory devices. Time-code equipment is also covered in the catalog. Use card or write *Datum, 170 East Liberty Avenue, Anaheim, California 92801.*

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EXPANSION MEMORY SHEET features the CorPak 12 expansion core-memory system for PDP-12 minicomputers which offers up to 28 K by 12 bits of expansion memory. The data sheet includes features, an illustration, specifications, and construction, maintenance, and service information. Use card or write *Information Control Corporation, 9610 Bellanca Avenue, Los Angeles, California 90045.*

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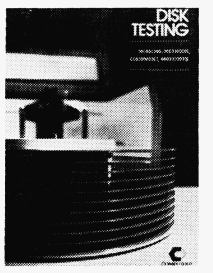
TESTING GUIDE on magnetic-disk testing deals with such areas as the reasons for testing substrates, disks and packs, magnetic recording theory, disk characteristics, and magnetic recording techniques as well as equipment selection and costing. Diagrams and photographs are also included. Use card or write *Computer Corporation, Three Computer Drive, Cherry Hill, New Jersey 08002.*



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TERMINAL MULTIPLEXERS BULLETIN presents the Multi-Term terminal multiplexers which offer home loop and communications capabilities. Applications, features, illustrations, and specifications are supplied. Use card or write *Delta Data Systems Corporation, Woodhaven Industrial Park, Cornwells Heights, Pennsylvania 19020.*

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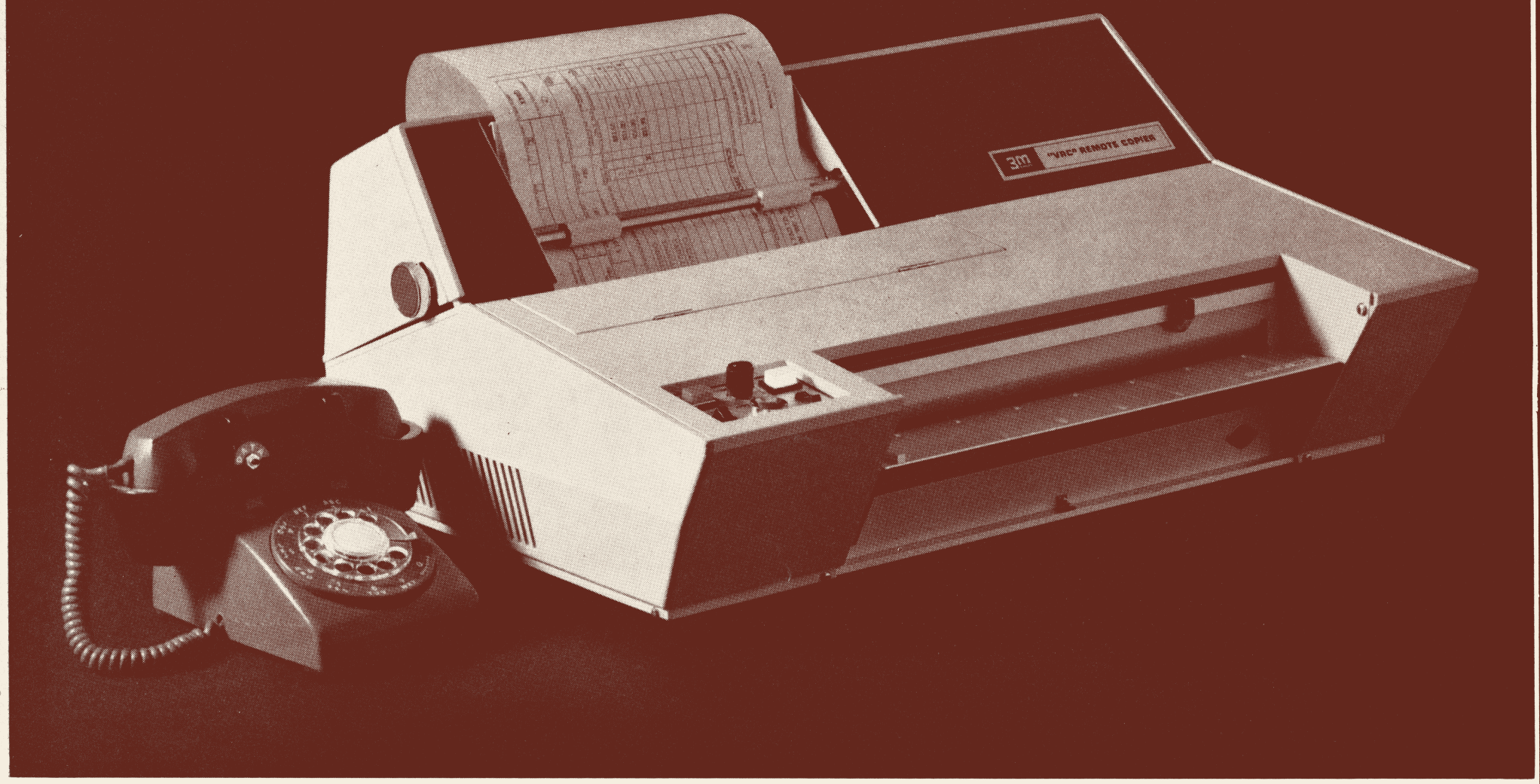
The 3M "VRC"



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The compact 3M Brand "VRC" is a long-distance copier that sends and receives important business communications on a personal basis. It handles information whether or not you are in the office. It can both receive from and send to most other kinds of remote copiers. You can send one message and receive another at the same time on the 3M "VRC." Written, drawn, printed or typed originals can be sent across town or around the world in four minutes. The copy you get is sharp and dry—and absolutely accurate.

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Circle 70 on Reader Service Card

TDS Turns to T-Carrier to Meet Demands of "Going to Growth"

Black Earth, a burgeoning mini-suburb of university-centered Madison, Wisconsin, offers proof of how a forward-looking common carrier can provide upgraded service for today's residents while at the same time insuring that tomorrow's growth can easily be met.

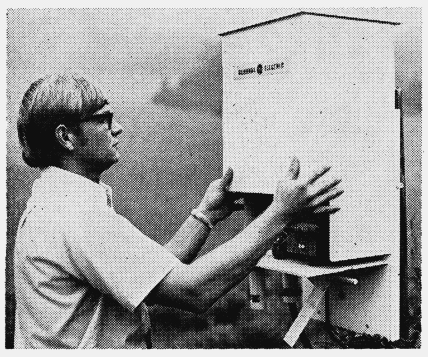
For Madison-based Telephone and Data Systems, the Black Earth company, represents a classic illustration of pinpointing a rapid future growth area and installing equipment now to meet future needs in the face of changing consumer expectations.

TDS, one of the nation's fastest growing independent telephone companies and now 21st largest in the United States, has followed this pattern of "going to the growth" since the firm was begun in 1968.

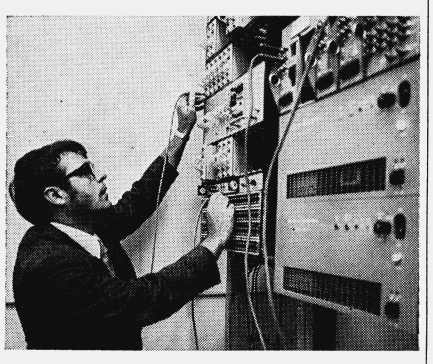
In matching service upgrading with the tandem goal of meeting future needs, TDS has turned to T-carrier systems as its primary method of reaching these goals quickly and efficiently.

TDS' Pulse Code Modulation T-carrier systems, supplied by General Electric's Telecommunication Products Department, use electronic signaling to make more efficient use of already existing telephone cables by multiplexing 24-channels of voice transmissions onto a single pair of wires. The result is a major increase in transmission capacity without the need to replace buried or aerial cables. The T-carrier systems are used primarily to move voice traffic on a trunking basis between local offices or between a local office and a toll center.

Currently, TDS has installed 11 GE TCS-26A PCM T-carrier cable systems within its group of subsidiary companies in Wisconsin. About 90 percent of the channel capacity of the systems serves to move traffic from class four local offices to toll centers while the remaining ten percent is used to carry Extended Area Service traffic. Repeater spacing on the systems vary with a 6,000-foot interval being used on the Black Earth system and a 4,500-foot interval on the other systems now being installed. Idle noise on channels is low and significantly better than required by Bell's compatibility specifications.



Routine inspection of repeaters along the newly-installed T-carrier line is part of TDS's continuing maintenance program. Dale Flack, Equipment Engineer, credits a unique TDS testing program with smooth turn-up of each of the T-Carrier systems now serving TDS companies.



Racked equipment for the GE T-Carrier system is examined by Merlin Haugestuen, supervisor of TDS' Southern Region in Wisconsin, in the Black Earth telephone company frame room.

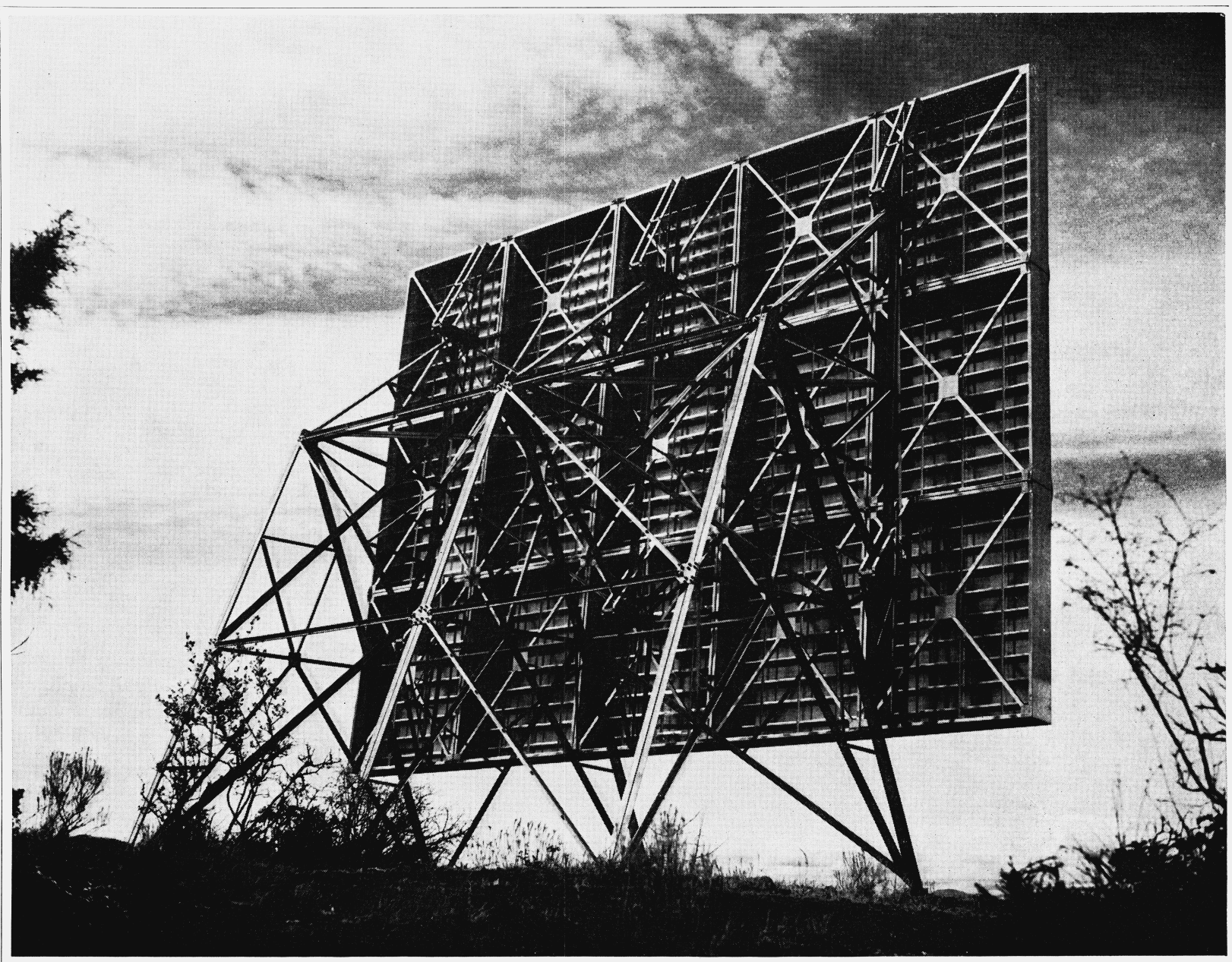
"Certainly," says Bob Laurion, TDS Chief Engineer, "our operating companies have different problems, but, just as certainly they face two common problems. One is to provide increased grade of service to their subscribers and second is to insure that growth factors are taken into account to meet the desires of tomorrow's subscribers. In our opinion, T-carrier systems are the wave of the future and provide the best alternative to solving both these problems efficiently and economically."

For residents of Neilsville, where TDS' Badger State Telephone Company operates, installation of a GE TCS-26A T-carrier system has meant that lines and circuits are available to carry their conversations into a toll center for switching onto national networks. Availability and efficiency of this service means a dairy farmer can get to one of his equipment suppliers quickly to solve his problem.

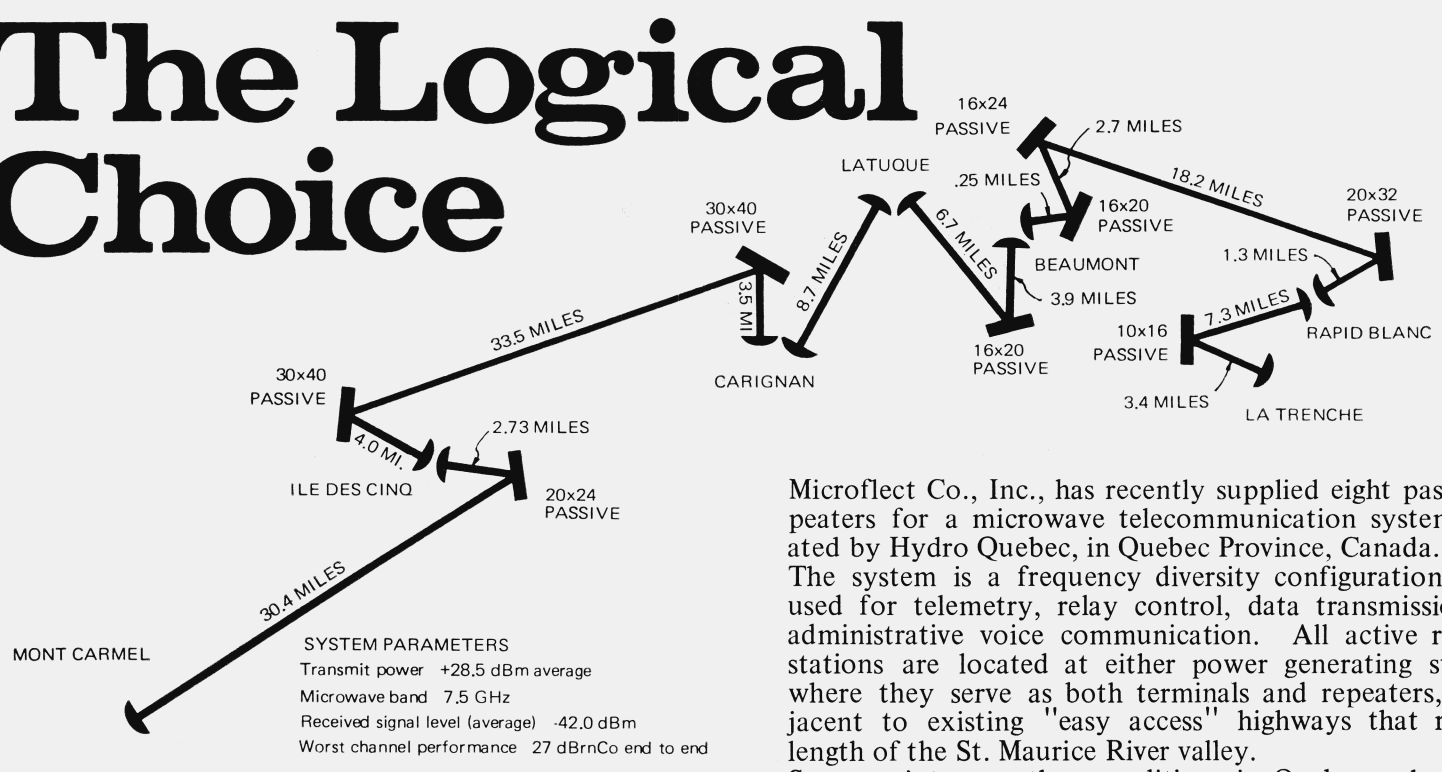
Among the major reasons why TDS has experienced little trouble with their T-carrier installations is a unique testing program designed by TDS to insure a smooth turn-up of the system.

For a period of 30 to 60 days, installing technicians have an opportunity to work with the equipment and get to know it intimately. This "debugging" concept has proven to be exceptionally valuable in preventing trouble once the line is open to actual traffic. Since most problems tend to develop in a system in the first 30 days after cutover, according to Dale, the outage time on the circuits is almost nil.

Mount Vernon Telephone is among several Telephone Data Services operating units in the Madison area now using General Electric T-Carrier systems.



The Logical Choice



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Transmit power +28.5 dBm average
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Received signal level (average) -42.0 dBm
Worst channel performance 27 dBrnCo end to end

MICROFLECT
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Microflect Co., Inc., has recently supplied eight passive repeaters for a microwave telecommunication system operated by Hydro Quebec, in Quebec Province, Canada.
The system is a frequency diversity configuration and is used for telemetry, relay control, data transmission and administrative voice communication. All active repeater stations are located at either power generating stations, where they serve as both terminals and repeaters, or adjacent to existing "easy access" highways that run the length of the St. Maurice River valley.
Severe winter weather conditions in Quebec, where temperatures drop to -50° Farenheit and heavy snows drifted by gale force winds, make the prospects of access to remote active repeater stations undesirable, if not impossible. Accordingly, the passive repeaters were selected as the logical choice.

CCTV Controls Unique PATCO Automated Rapid Transit Line

At PATCO headquarters in Camden, New Jersey, this control center is used to operate the entire high speed rail transit system, consisting of 14 miles of track, 75 automated cars, and 12 unattended, modern stations.

Commuters from Philadelphia and outlying points in New Jersey are using one of the most unusual high speed transit rail lines ever devised, said to be the first automated transit system in service. A one-man crew is used to push the start button, and to open and close the doors. Everything else along the 14-mile route from Lindenwold (New Jersey) to downtown Philadelphia, is programmed.

What makes this even more unique is that all along the route of the Port Authority Transit Corporation line, in every modern station, there is not a single attendant, ticket seller, gatekeeper, or any other permanent personnel. Yet, despite this seeming lack of attention, the stations are better maintained than ever before. Providing these features are two-way visual and audio communications based on a closed circuit TV system.

Called by a variety of names . . . PATCO, Lindenwold High Speed Line, and so on . . . the system is operated by a wholly owned subsidiary of the Delaware River Port Authority, the Port Authority Transit Corporation. It is the culmination of years of planning and construction. The line presently has 75 high speed rail cars which are capable of reaching speeds of 75 miles an hour from a standing start in less than 75 seconds.

By carrying more than 30,000 passengers per day, up to 6,500 per hour during peak conditions, the high speed line has appreciably reduced highway congestion and provided commuters with a 22-minute ride from one end of the line to the other, a trip which still takes at least one hour by auto during peak-hour traffic conditions. Maximum fare for the 14-mile trip is 60 cents. According to one commuter, he could not even park his car in downtown Philadelphia for less than $1.50.

CCTV Has Two-Fold Task

"Within each station, the primary job of the CCTV system is two-fold," explains J. W. Vigrass, Supervisor of Traffic & Planning. "One of these jobs is passenger assistance and this is effected by means of a public address system which is controlled from the operations center near the Broadway Station in Camden, New Jersey. If a passenger has a question or needs assistance in using the automated fare collection system, a special telephone is provided in each station which the customer can use to contact the control center. Meanwhile, the control center operator has a clear CCTV view of the station and the passenger."

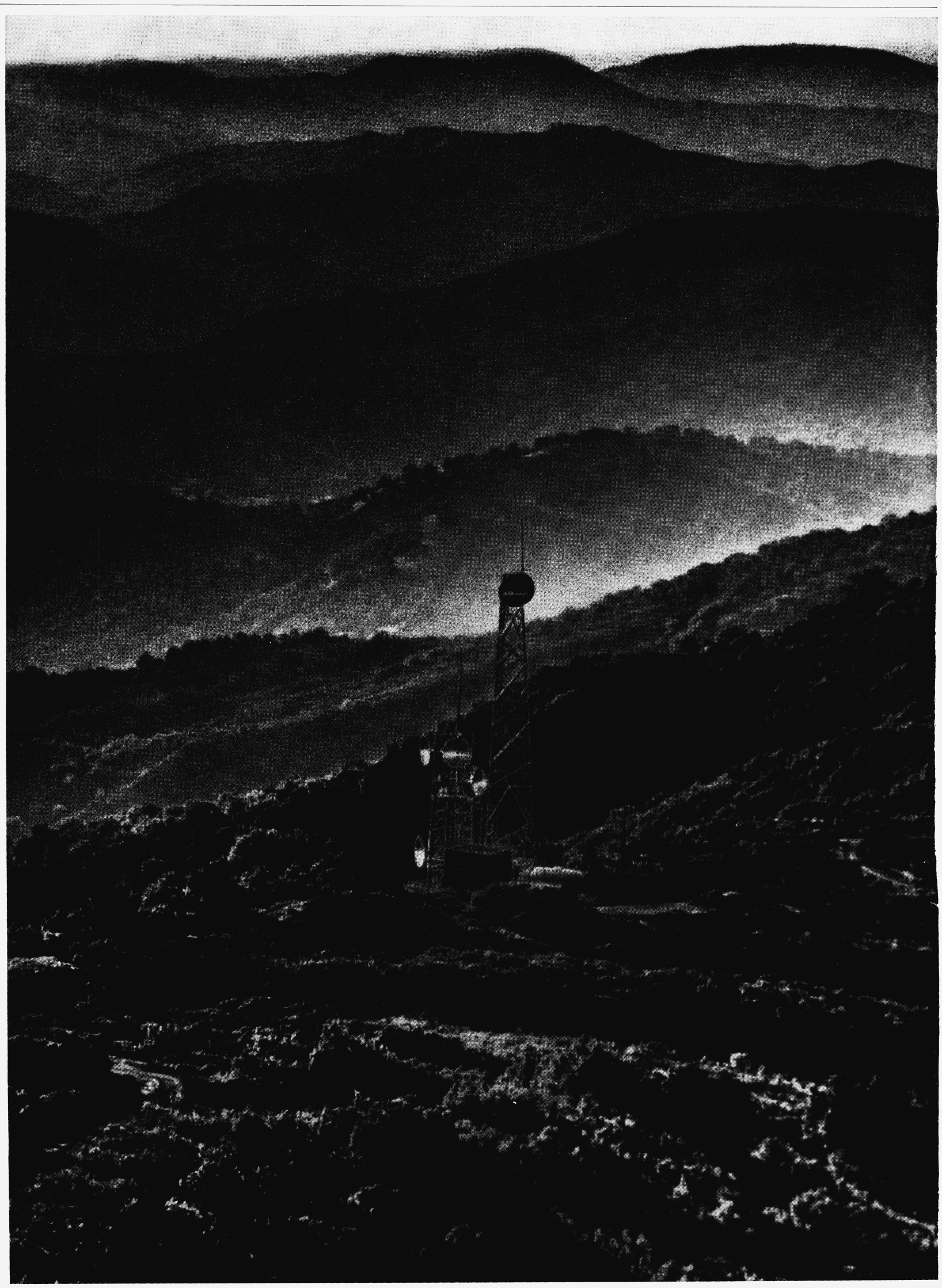
The second and perhaps more important duty of the CCTV system is security. Through the TV screens, the control operator can observe people loitering in the station and generally scan the scene for vandalism or other unauthorized activities.

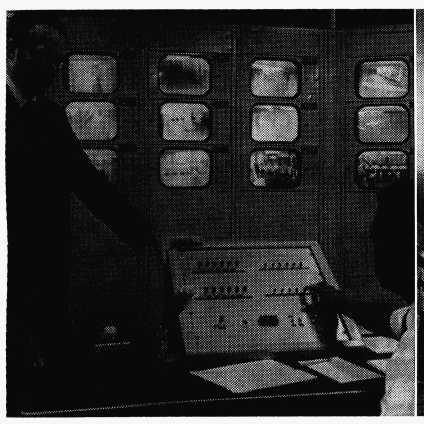
A secondary function of the CCTV system is the coordination of maintenance activities. The operator at the control center can observe maintenance men at their jobs and can summon them on the PA system and direct them to new assignments. In this way the TV serves as a communications center for all activities including passenger assistance, security and station maintenance.

"Security is perhaps the single most important job for the CCTV system," comments Vigrass. "One of the continuing duties of the TV monitor is to watch for fare evasion. A person can easily jump over the gates and avoid payment of the fare if he chooses. With no one in the stations, some people, especially juveniles, are tempted to avoid payment of the 30 to 60 cent fares."

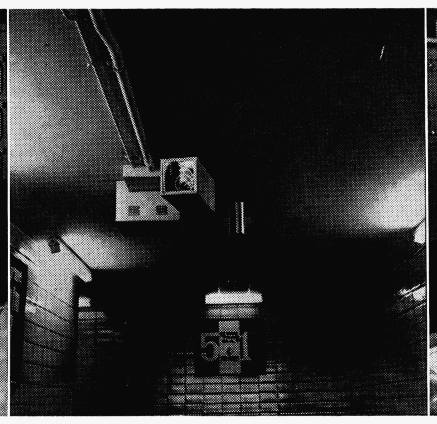
"What the gate jumpers may not realize," continues Vigrass, "is that the ticket gates are under direct TV surveillance and the control operator can spot an offender in an instant. As a matter of fact, the gates are always the objective of at least one fixed focus TV camera."

When an offender is spotted he receives an immediate warning from the control operator via the PA system. This undetected observation usually startles the offender and he will return to purchase his ticket from the vending machine. If not, the control operator will summon a supervisor or a member of the PATCO security staff to proceed to the station to apprehend the violator. The control center also maintains direct two-way communication with the lone attendant (motorman) aboard the train and can alert him to be on the lookout for a person entering the train at a particular station without a valid ticket.

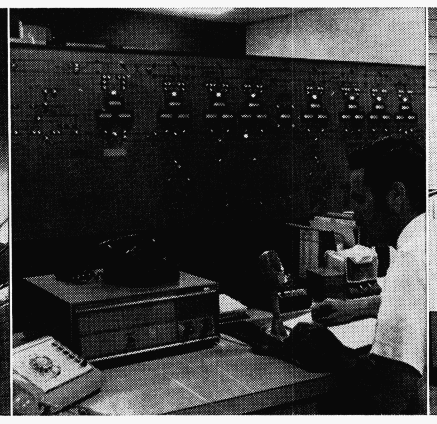




This console, equipped with 21 CCTV monitors (one a spare) is manned 24 hours a day. From here, a single operator provides security and passenger assistance for all the unattended stations. CCTV administered stations operate more efficiently.



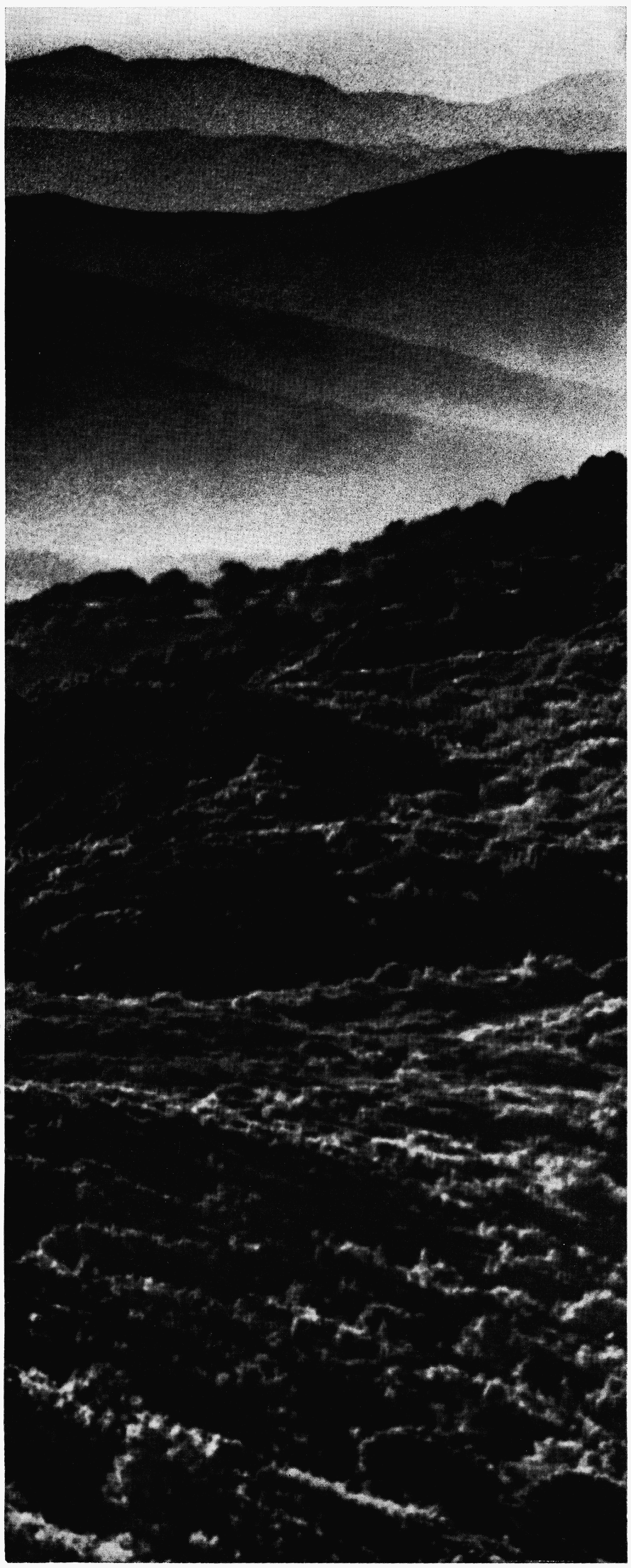
Inside each station are CCTV cameras, mounted from the ceiling. Through these cameras, the control operator can observe people loitering, watch for vandalism and spot fare evaders . . . and warn offenders by the PA system.



The power director, sitting adjacent to the monitors, can use his Motorola two-way radio system to contact the 17-man PATCO police force and all maintenance workers in case of any emergency anywhere on the line.

The watchful eye of the Motorola CCTV camera (mounted at ceiling) has proven to be a superior detection system than an attendant who can only be in one place at a time. And the need for at least 50 jobs has been eliminated.

By using this special telephone inside each station, a commuter in need of assistance can dial a direct line to the control center. This phone is within viewing range of the CCTV cameras. Sign warns users it is not a public telephone.

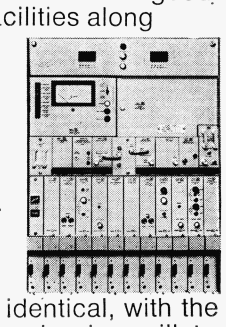


We have a compact, reliable microwave system that fits very nicely in the middle of nowhere.

It's a combination of two GTE Lenkurt systems—the 36A Radio Multiplex and the 78F2 2-GHz Microwave Radio.

Together, they give you the size and reliability needed for voice and data transmission at remote locations.

A 12-channel system, both multiplex and radio, takes less than 23″ on a standard 19″ equipment rack. So chances are good it'll fit easily in existing facilities along the line.



Specifically, the 36A multiplex has been designed for light route service. It's expandable in single channel increments up to 72 channels. And, up to 192 channels using supergroup equipment.

All channel units are identical, with the frequency determined by a plug-in oscillator. This allows a considerable savings in spare-parts inventory—instead of complete channel units for each operating channel, you only need a single channel unit and a spare plug-in oscillator for each operating channel.

The 78F2 radio provides pushbutton metering on the front panel for fast, simple routine maintenance and fault location—even to individual subassemblies. And all routine maintenance can be done without interrupting service.

Together, the 36A and 78F2 make a compact, reliable system, anywhere and everywhere.

To find out more, write GTE Lenkurt, Microwave Systems, 1105 County Road, San Carlos, CA 94070.

GTE LENKURT

Circle 72 on Reader Service Card

Although the stations are operated without any permanent personnel in attendance, there is a full-time security force of 17 men, four of whom are constantly available on foot or via patrol car. In addition, there are supervisors and maintenance personnel who are also frequently available and can help provide passenger assistance or lend help if a security problem arises.

To help maintain coordination and rapid contact with the security and maintenance personnel, Motorola mobile radios and portable "Handie-Talkie" radios are used to round out a complete communications system. Each radio user can immediately contact the control center or receive messages from the center. At the center, there is also a direct telephone "hot line" to the regular police facilities. If trouble should arise which can't be handled by the local security force, outside help can be called simply by pressing a button on the telephone.

Have 20 Camera Locations

The entire CCTV system presently consists of 20 camera locations in 12 stations. Because of size and multiple entrances, the main station at 8th and Market Streets in Philadelphia, which is underground, has a total of 4 cameras in operation. At Lindenwold, also a very busy station at the far end of the line, there are two cameras. All of the other stations in New Jersey have one camera and this is usually capable of including the main fare collection gates, change-making machines and emergency telephone.

The TV monitor located at central control tower in Camden is equipped with 21 14-inch screens. The console is "U" shaped and contains three horizontal rows of seven screens. The 21st screen is used for a spare. Maintenance of the CCTV system is split between Motorola and a local firm specializing in the installation and maintenance of coaxial cable. All inside components are maintained by Motorola.

One of the technical problems involved in the installation of the system was the heavy amount of electrical induction picked up from the high voltage (700 volts dc) "third rail" and the 26,400 volt high tension line on either side of the track. Yet another obstacle to overcome was the unweighted midpoint of the control center. In one direction the cable extends only four miles to Philadelphia. In the other direction, the cable is 10 miles in length from the control center to Lindenwold and serves a total of six stations and seven cameras.

The use of both the CCTV and the other two-way radio equipment . . . all Motorola . . . has been very helpful in speeding communications to various operating departments within PATCO. The makeup of trains at the switching yard can be instantly modified by communications received by radio and this provides a much more efficient utilization of equipment and personnel, according to Vigrass. Maintenance personnel working out along the line can be summoned very quickly to any trouble spot through the use of radio.

Radio Service Greatly Increasing Revenues of Kalama Telephone

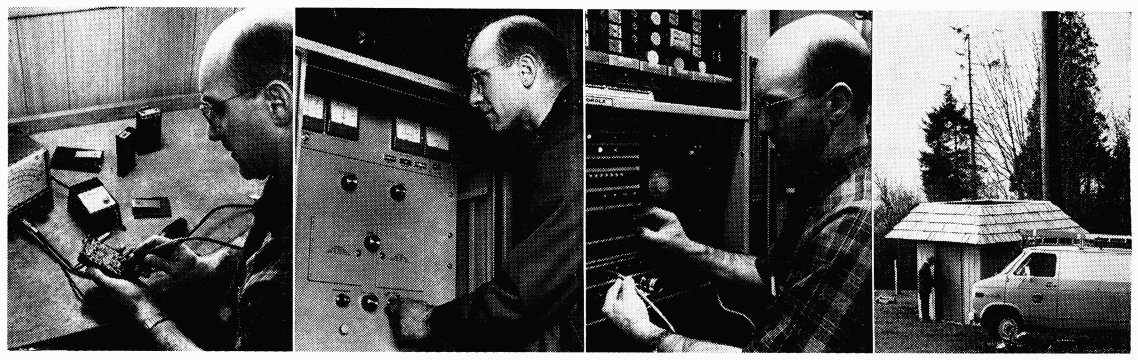
Ron Coffey, manager of Kalama Telephone Company in Washington, points out the improved features of the new Motorola "Pageboy II."

Radio service has greatly increased the revenue of the Kalama Telephone Company . . . a small, closely-held family corporation serving subscribers in southwestern Washington.

Founded in 1904 by Green Coffey, the business started in the back of a confectionery store with three telephones.

By the time Green's son, Darrel, took over the company in 1924, the business was serving nearly 200 customers. The next 47 years saw the company grow to over 1300 telephones and its assets go from $18,000 to nearly three-quarters of a million dollars.

Darrel Coffey, who retired in 1966, introduced radio to the area. He had become interested in ham radio while in high school and had one of the first radios in Cowlitz County. He was a charter member of the Kalama Fire Department and saw the need for radio communication to supplement regular telephone services.



Kalama Tel's Don Armeni does maintenance on a pager, adjusts car telephone equipment, checks the paging transmitter, and inspects the paging tower equipment.

Today, Darrel's son Ron is the company manager. Ron and his five associates offer not only desk and wall phones, dial-in-handset phones, speakerphones, automatic dialers, stylish "Ericofons," built-in-the-wall panel phones and special phone features, but also car telephones and personal radio paging service.

Mobile radio telephone is available on a two-channel, fully automated basis. Calls can be dialed directly to and from a car anywhere in the United States and Canada.

The first "Improved Mobile Telephone Service" radio channel was installed in 1966 and in 1968, paging was "piggybacked" on this channel. There were 40 tone-only "Pageboy" paging customers then. In 1970, the second IMTS channel was installed and later that year a separate paging system was added.

Today, there are 44 car telephone subscribers and 106 "Pageboy" radio paging customers (40 are tone only and 66 are tone and voice). Through agreement with Pacific Northwest Bell, nearby Longview, Washington, residents subscribe to Kalama "Pageboy" paging service.

In only six years of radio business, revenues from radio equipment have increased to some 12 percent of the company's total revenue. In fact, 1971 revenues from radio services exceeded 1961's total local exchange billing.

For the future, Coffey predicts continued modernization and improved service for the local users of radio.

"We at Kalama Telephone Company believe," says Coffey, "that today a total communications concept is necessary for the survival of the small, independent telephone company. Radio makes us and our customers modern and up-to-date. It does our company tremendous good in building our public image, it wears well and it sells itself."

Dick Haab, assistant production superintendent at Kalama Chemical, carries his "Pageboy II" radiopager when checking shipments.

George Kress of Kress Sand & Gravel Company in Kalama says that his Motorola car telephone has saved him as much as a month of his rent when he has had a pickup break down in the mountains.

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THE BETTER WAY FOR YOU TO MEET THE CHALLENGE OF TO-DAY'S FAST-EXPANDING COMMUNICATIONS REQUIREMENTS.

MCS 6900 digital radios with PCM voice and TDM data multiplexers...from Canadian Marconi Company.

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Circle 74 on Reader Service Card

On Review

New books you can use in your communications work

BASIC ELECTRONIC INSTRUMENT HANDBOOK, by Clyde F. Coombs, Jr., is a valuable reference tool covering all basic aspects of electronic instrumentation. Written specifically to provide information to those at various levels of electronic sophistication, the book devotes its early sections to a discussion of basic instrument techniques and problems, such as electrical measurement, signal generation, and electronic standards. The handbook proceeds to several large sections dealing with the analysis of specific instruments such as voltmeters, ammeters, oscilloscopes, and others. 836 pages. Price: $28.50. Write *McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, New York 10020.*

HANDBOOK OF NOISE MEASUREMENT, by Arnold P. G. Peterson and Ervin E. Gross, reflects the latest developments and techniques in noise measurement and analysis. Some topics new to the seventh edition include methods of time-series analysis, industrial audiometry, and the noise provisions of the Occupational Safety and Health Act (OSHA). The handbook includes chapters on noise and vibration, what noise and vibration do and how much is acceptable, instrumentation for measurement, noise and vibration control, and other topics of significance for those involved with the measurement, analysis, and control of noise and vibration. 328 pages. Price: $7.50. Write *General Radio, 300 Baker Avenue, Concord, Massachusetts 07142.*

101 QUESTIONS AND ANSWERS *About AM, FM, and SSB,* by Leo G. Sands, covers both the history and basic technical aspects of the three types of modulation, as well as receivers that are used for demodulation (converting the transmitted information back into its original form). Divided into three parts (AM, FM, and SSB), the guide contains questions and answers concerning the advantages and disadvantages of each modulation and demodulation method, as well as the basic circuits employed in the process. 96 pages. Price: $3.95. Catalog No. 20919. Write *Howard W. Sams and Company, 4300 West 62nd Street, Indianapolis, Indiana 46268.*

COMPUTER-AIDED MANUFACTURING *in Electronics, Introduction to,* by Douglas A. Cassell, is designed to fill the need for a compendium of basic technical and managerial guidance material on the subject of CAM systems. The volume provides managers and engineers with the back-ground for understanding the factors involved in computerized problem-solving and the capabilities and limitations of available tools. The volume answers such questions as, "How can management implement CAM systems in our organizations?". 248 pages. Price: $12.95. Write *Wiley-Interscience, A Division of John Wiley & Sons, Incorporated, 605 Third Avenue, New York, New York 10016.*

GEOSTATIONARY ORBIT AVOIDANCE *Computer Program* discusses a new computer program, describing the calculations needed to enable terrestrial radio-relay operators to avoid pointing their antennas at the geostationary orbit of communications satellites. FCC rules prohibit radio-relay operators from pointing 6-GHz transmitting antennas within two degrees of the geostationary satellite orbit (Section 21.108 (e)). The two methods referred to in the rules for making this determination are covered. The first method is an approximate one useful mainly as a screening tool, and the second is a more precise technique, satisfactory for calculations by hand. Price: $3.00. Write for Accession No. PB 211500, *National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22151.*

MAGNETIC RECORDING, by Charles E. Lowman, covers the technology of magnetic recorders used in such fields as audio recording, computer data systems, and broadcast and closed-circuit television. The book, authored by Charles E. Lowman, presents the basic concepts of magnetic recording fundamentals in clear, easy-to-understand language, illustrated with simplified sketches, block diagrams, and photographs. Covering the practical as well as the theoretical aspects of the field, the book includes information on cassette and cartridge recorders, TV recorders, and direct and FM signal electronics from lowband to very wideband. 288 pages. Price: $14.50. Write *McGraw-Hill Book Company, 1221 Avenue of the Americas, New York, New York 10020.*

DIGITAL CIRCUITS, *Practical Application of,* offers four laboratory manuals representing a complete self-learning digital training program including both theory as well as practical experiments. Each manual provides dozens of down-to-earth examples, many questions and answers after each chapter, and several series of "hands-on" experiments. Hundreds of drawings and schematics are used to clearly illustrate every technical detail. Manuals include Part I—Basic Logic Gates; Part II—Minimization Techniques, Code Conversion, Flip-Flops, and Asynchronous Circuits; Part III—Practical Sequential Theory and Synchronous Circuits; and Part IV—Hybrid Digital Integrated Circuits. Price: $15.80 for set of four manuals. Write *General Electronics Associates, Post Office Box 156, Northfield, Ohio 44067.*

THE TELEPHONE AT WORK is a 16-mm color motion picture showing how the telephone can best be used as a valuable aid to business communication. Through a series of up-to-date, realistic, exciting examples, this 15-minute color film demonstrates how voice and manner can substitute for face-to-face contact. It shows how to improve your "telephone personality". Price: $300.00; rental, $50.00 per week. Write *Roundtable Films, Incorporated, 113 North San Vicente Boulevard, Beverly Hills, California 90211.*

IBM SYSTEM/370 ADVANCED FUNCTION *Virtual Memory* is an explanatory and analytic treatment of the direction taken by System/370—virtual memory, its characteristics and capabilities, and the implication of these for systems in current use. The report describes what virtual memory can and cannot do in an operating environment. Consideration is given those new hardware and software offerings associated with virtual memory, the advantages and disadvantages of advanced-function capability, and the pros and cons of virtual memory performance in comparison with that of non-virtual systems. 24 pages. Price: $25.00. Write *Auerbach Publishers, Department PR 10484, 121 North Broad Street, Philadelphia, Pennsylvania 19107.*

E & E RADIO HANDBOOK, by William I. Orr, is a completely revised and updated manual for amateurs, electronics engineers, and technicians in the radio industry. The volume contains authoritative, detailed instructions for designing, building, and operating all types of radio communications equipment, together with the latest information on all that's new in radio. Price: $13.95 (Prepublication price before December 1, 1972). Write *Editors and Engineers Division, Howard W. Sams and Company, 4300 West 62nd Street, Indianapolis, Indiana 46268.*

MINICOMPUTERS IN DATA PROCESSING *and Simulation,* by Branko Soucek, discusses the new dimensions in laboratory research, measurement, and control techniques that minicomputers are opening up. Theory and application of digital measurement, processing, and simulation of data are presented in the volume. Numerous illustrations are also supplied. 464 pages. Price: $19.95. Write *Wiley-Interscience, A Division of John Wiley & Sons, Incorporated, 605 Third Avenue, New York, New York 10016.*

APPLICATION OF COMPUTERS *to Engineering Analysis,* by John R. Wolberg, offers a systematic, versatile approach to the kinds of computer analysis problems that engineers actually face in their work. The book explains advanced concepts and techniques otherwise learned only through random experience on the job. Contents includes The Computer in Engineering Analysis; Mathematical Model—development from problem statement to debugged model; Useful Numerical Techniques—practical aids; Methods for Evaluating Program Qaulity; and more. 288 pages. Price: $14.50. Write *McGraw-Hill Book Company, Post Office Box 400, Hightstown, New Jersey 08520.*

MODERN OPERATIONAL CIRCUIT DESIGN, by John I. Smith, is a valuable collection of tested circuits and design techniques—complete with data, formulas, and graphs—involving the modern operational amplifier. Circuits are contained for unity-gain inverter, inverting amplifier, dynamic error and stability, integrator and differentiator, follower, precise diode, instrumentation, voltage-, and current-meter applications. Signal flow and feedback are presented in the form of linear and nonlinear analog circuits. 256 pages. Price: $16.00. Write *John Wiley & Sons, Incorporated, Post Office Box 4192, Grand Central Station, New York, New York 10017.*

Circle 75 on Reader Service Card

Modern Communications System Serves Cathedral of Tomorrow

By now, most Americans are aware of the Reverend Rex Humbard and his televised weekly Sunday morning gospel message originating from the Cathedral of Tomorrow in Cuyahoga Falls, Ohio. It's estimated that his program reaches 20 million viewers on 400 stations scattered world-wide. In addition, a congregation of 5,000 actually attends the services.

What's not generally realized is the behind-the-scenes effort that makes all this possible and the modern, up-to-date communications system that pulls it all together. Ohio Bell Telephone company has been involved from the beginning, helping to provide internal as well as external telecommunications needs.

Many things have happened since Reverend Rex Humbard first set up a traveling gospel tent near the Akron, Ohio, airport in 1952. Because of the overflow crowds that attended those early services he eventually decided to settle in the area. The result is a $3,500,000 circular Cathedral, completed in May, 1958.

Reverend Humbard, a firm believer in modern communications, feels that through the medium of television he can reach millions of people who wouldn't otherwise attend any kind of church service. With this in mind, the Cathedral was designed to provide television crews maximum working capacity. The structure contains 22 camera outlets, a hydraulic lift providing cameras any desired viewing level, and a 25 foot, remotely controlled speaker's platform. However, a 100 foot illuminated cross, hanging overhead, reminds the audience that this is more than an ordinary TV studio.

Today, the Cathedral's assets are nearly $45 million including a college campus in Michigan as well as a factory in Brooklyn. Outside of the cathedral, probably the best known property is the adjacent television studio complex. This consumes a large portion of the 14½ acre complex and houses facilities for both the now active Cathedral Teleproductions and the still under construction WCOT-TV (Channel 55).

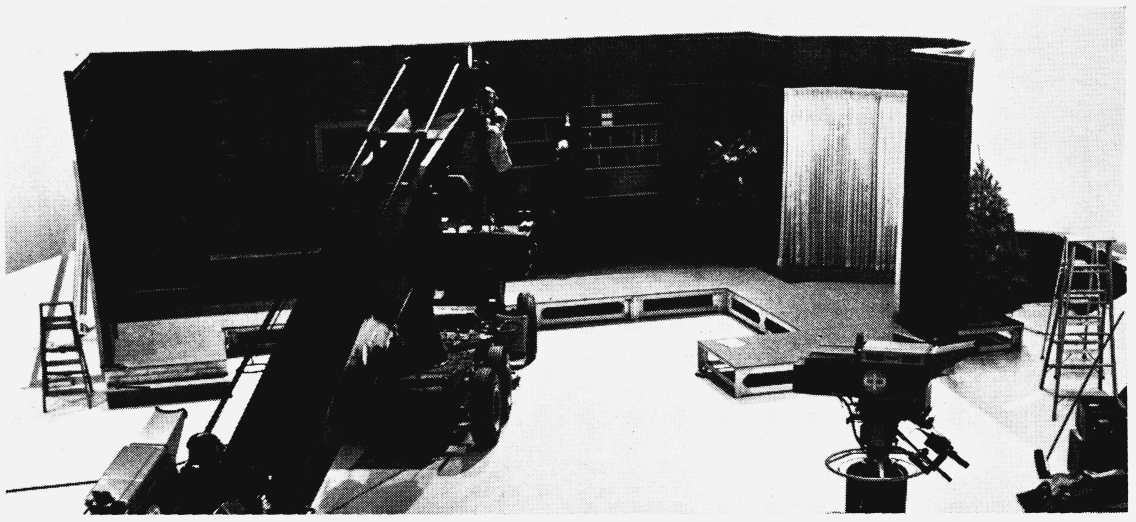
While the Cathedral of Tomorrow's Sunday service is being televised via video tape, the production department is busy taping a live program received via the Bell System's Video Network, originating in Lynchburg, Virginia. The network links an organization point and a production facility several hundred miles apart.

All the production is done by Cathedral Teleproductions, which not only makes the video tapes and produces the Sunday Show, but is in addition, a complete television production company. It has a full time staff and competes actively for commercial production business.

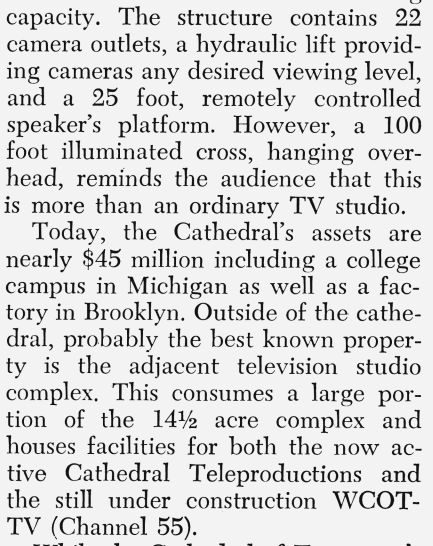
According to Dwyane Stephens, General Manager of WCOT and Cathedral Teleproductions, "we started slowly at first with black and white cameras and initially didn't even have a transmitter. However, we're now on 400 stations . . . the largest syndicated program in the world."

Dwyane makes no secret about his plans for WCOT and Cathedral Teleproductions. "I want this to be the finest teleproduction studio in the country," he says. "I want the top national agencies to get to know us and build up a loyal following. Therefore, we must continue to use all the latest communications methods."

The idea of expanding into commercial production received impetus after the Cathedral was awarded.



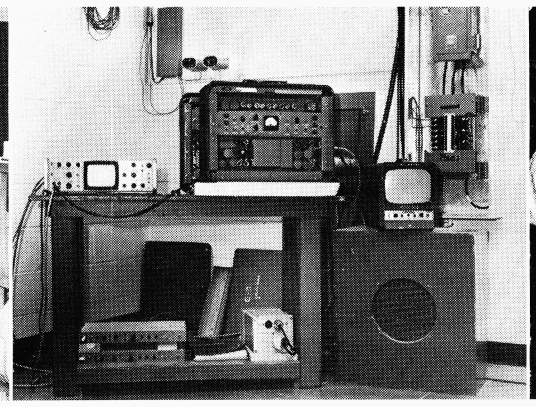
Cathedral Teleproductions was formed soon after Channel 55 was awarded in November, 1967. According to Dwyane Stephens, general manager of both, "it soon became obvious that we needed greater production facilities and didn't want to leave equipment unused between Sunday services." A new building was constructed containing three studios, each equipped with its own control and audio rooms. Two of the studios are among the largest in the country as this picture indicates . . . 60′ x 85′ with a 40′ ceiling. A smaller studio takes care of emergencies or local news programs.



Dwyane Stephens, General Manager of WCOT-TV (Channel 55), as well as Cathedral Teleproductions says, "I want this to be the finest teleproduction studio in the country. Television is in my blood and I couldn't be happy doing anything else. We've got the staff and the best equipment so there's no reason why it shouldn't work."

Michael Sneddon, operations supervisor, is shown in the audio control room of a production studio at Cathedral Teleproductions' new facility in Cuyahoga Falls.

Each studio also uses a post production room containing seven video tape machines. Plans eventually call for 20 video tape machines.



This piece of electronic equipment controls and monitors the Bell System's facilities in use at Cathedral Teleproductions.

John Purdey, producer director of Cathedral Teleproductions is shown here with Greg Carter, Technical Director, monitoring the Rex Humbard Show.

Channel 55 in November 1967. It soon became apparent that greater production facilities were needed, which meant an enormous capital investment in new equipment.

A huge building was soon constructed containing three studios, each equipped with its own production room. In addition, there are post production rooms containing nine video tape machines (plans eventually call for 20). The building also includes a 900 seat restaurant.

"We eventually hope to produce a daily entertainment show there for WCOT," Stephens discloses, "somewhat along the lines of a Mike Douglas or Phil Donohue show."

The dimensions of two of the studios are 60' x 85' with a 40' ceiling. Each includes at least three cameras (plans call for six), a fully equipped control room, an audio control room plus a full production crew, including a staff director and house lighting director.

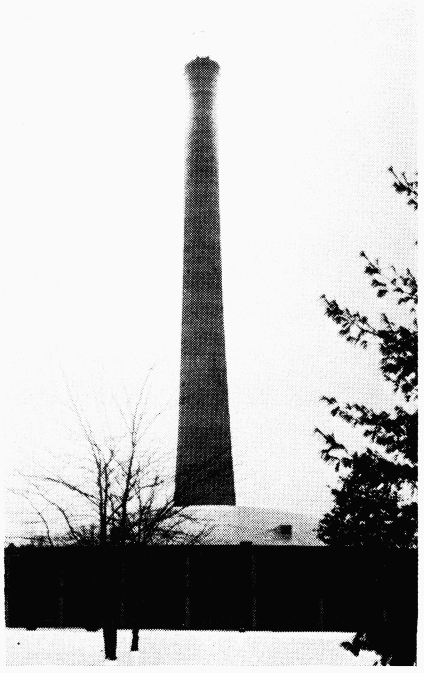
"We never want to hold up production because we don't have a piece of equipment," says Stephens, "and when an agency rents our facilities, we want them to feel that the entire studio belongs to them until a commercial is finished."

Outside communications are equally, if not more, important. Chuck Welch, also of Ohio Bell, who works closely with Dwyane Stephens, explains how the Bell System plays its part. "The first request for our facilities was from the original organization . . . that's the Cathedral of Tomorrow. That was about 15 years ago on New Year's Eve, when we gave them the ability to transmit live television from the Cathedral to just a few television stations. However, this past year the New Year's Eve telecast was transmitted to over 200 stations.

"From the beginning, we provided temporary, microwave video facilities to meet the immediate demand. Of course, even then, we were anticipating a permanent cable to fulfill the video requirements of both Cathedral Teleproductions and WCOT. Conduit requirements were specified and met, locations were discussed and wall and floor space needs forecast.

"By now, 130 stations receive the New Year's Eve broadcast live over the Bell System Network and about 400 other stations world-wide telecast the weekly program via video tape.

"From our point of view," explains Welch, "it's been an enormous help that we were involved from the beginning. As soon as this building was being discussed, we sat down with Rex Humbard, Jr., and Dwayne and looked at the engineering designs and specifications. We've been able to meet demands as they arose because the ability to expand was built in right from the start."

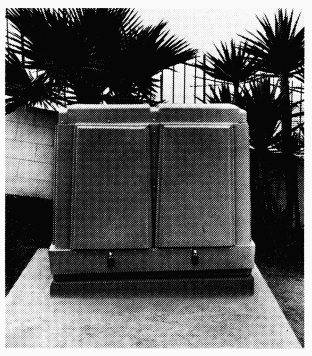


This view of the Cathedral of Tomorrow in Cuyahoga Falls, Ohio, shows the 750 foot tower which will eventually house transmitting equipment for the Cathedral's Channel 55 (WCOT-TV).

Our PCM Subscriber Carrier installation took one day, two men and four cable pairs. And made forty-eight customers happy.

We call it our 910A PCM Subscriber Carrier System.

Inside that lockable, weather-proof, remote housing are two 24-channel systems. So, it's made 48 new customers very happy with their quicker-than-expected single-party service. (Go multi-party and you can do the same thing for 192 new customers.)



Perfect for those somewhat unexpected "community of interest" areas like trailer parks, office buildings, and apartments that seem to spring up overnight. It's also ideal for outlying areas where the revenue may not justify the expense of burying a lot of copper.

But don't get the idea our 910A is only a "stop-gap" measure. It's designed for long-term and very high quality service. The 910A with D-2 type encoding provides standardization for intertoll, toll-connecting, direct, and subscriber trunk applications. This standardization means common maintenance for lower training costs and inventories.

The 910A has the reach of the latest central office with its maximum subscriber loop of 1600 ohms. And, the quality of the 910A service is as good as a community dial office—without the expense. You don't have to live with the limitations of a concentrator, either.

Channel units can be purchased to fit your present requirements and new ones purchased as you need them. Individually, if you wish. And these channel units are for bridged ringing, divided ringing, and pay station use.

For more complete details, write GTE Lenkurt, PCM Subscriber Carrier System, Department C134, 1105 County Road, San Carlos, CA 94070.

GTE LENKURT

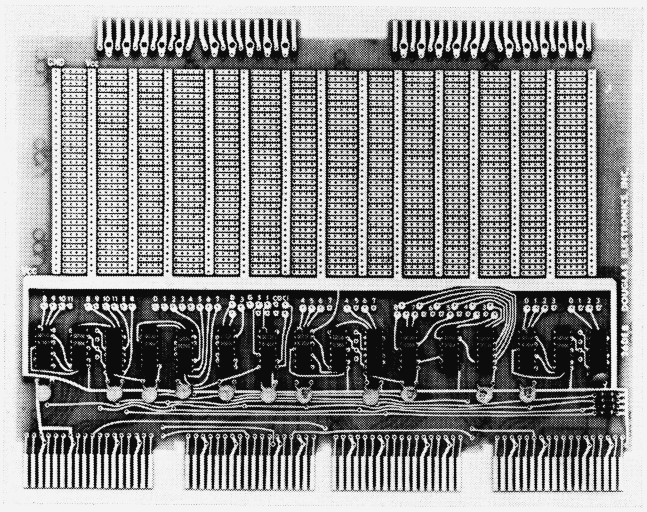
Circle 77 on Reader Service Card

Lab Report

New developments in communications technology

Interface Breadboard

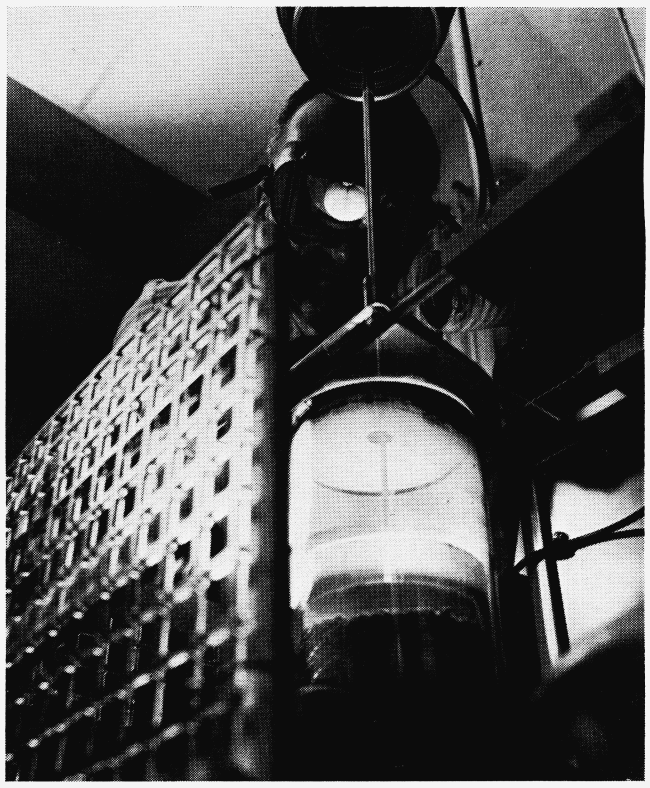
A basic interface breadboard for use with Digital Equipment Corporation's computers is available from Douglas Electronics. The new board, called 26-DE-8L, has all the



basic input/output components and circuitry already installed so special I/O devices can be interfaced with a minimum of handwiring. The board contains all circuitry necessary for data transfer to and from the data bus lines (with latches on output) including device selection, operation decoder, SKIP, CO, CI, INT. REQ., buffered TP3, memory latch, and clear. The breadboard portion permits the use of 14, 16, 24, or 36-pin IC's. The board is made from FR-4 glass epoxy, laminated with two ounces of copper on both sides. Finish is 0.00002-inch gold. All holes are #62 plated-through drill (0.038).

Crystals Grown Automatically

The quality of synthetic crystals for communications systems has been improved with a new computer-controlled crystal-growing method devised by Bell Laboratories. The system has been used to grow a type of garnet substrate material for magnetic "bubbles," a technology that may be useful for information storage in the company's electronic switching systems and in computers. This rare-earth garnet, called gadolinium gallium garnet, can be grown with greater control over the growth process and crystal diameter. A man-made crystal formed by slowly pulling a crystal "seed" out of a container of molten material should be of uniform diameter in order to minimize defects. Control of crystal diameter ordinarily requires constant surveillance of the developing crystal by a skilled technician during a 20-to-30-hour growth cycle. In the automatic system a digital scale records the weight of the molten material from which the crystal is drawn. These readings are used by the computer to calculate the rate of change of crystal weight which, in turn, provides an indication of the diameter of the crystal as it is formed. To maintain a uniform crystal diameter, the computer is programmed to alter the growth rate by continually adjusting the rate of change of power input to the furnace. These



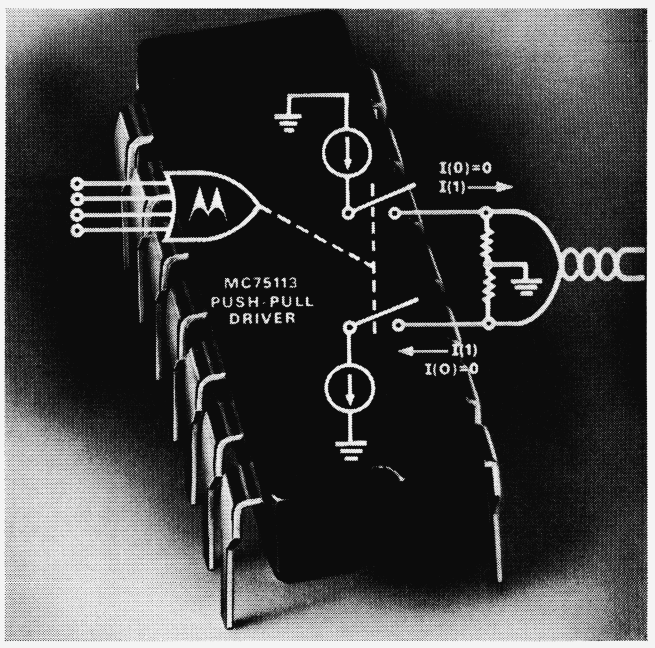
adjustments are made automatically, without the need for observation or manual control by an operator. A computer system such as this could be used to control a multistation crystal-growing facility.

10.6-Micron Laser Communications System

A laser communications system, operating at a 10.6-micro wavelength and capable of providing a wideband communications channel over a five-mile path, even in the presence of moderate rain or fog, has been developed by Hughes Aircraft Company. The experimental system consists of a transmitting station and a receiving station. The transmitter uses a sealed-off air-cooled carbon-dioxide laser, with frequency modulation provided by an intracavity crystal of cadmium telluride. The receiver uses optical heterodyne detection with a mercury-cadmium-telluride detector cooled with liquid nitrogen contained in a dewar. The system, although designed primarily for terrestrial communications, also offers potential application in space. Power output of the laser is 1 W, and the system provides a single communication channel using a 5-Mb/s frequency-shift-keying digital format. A data rate of greater than 300 megabits is possible with design modifications, and the system has the potential of handling 10 television channels.

Line Driver Facilitates Party-Line Operation

A new driver IC for transmitting data at high speeds over long distances has been announced by Motorola Semiconductor Products. The MC75113 was primarily designed to be used in data-transmission systems where numerous drivers and receivers share a common twisted-pair line. This is often referred to as the party-line mode. Unlike most drivers which use a current source switched between the two output lines, the device uses a matched current source on one line and current sink on the other. The currents are switched on and off in response to the input logic conditions. Thus, all drivers connected to the line appear as an open circuit unless they are in the ON state. This technique avoids the necessity of *inhibiting* gates to dis-



able the drivers not transmitting data. Even if the power supply to a particular driver is turned off, the driver will not load the transmission line. Since both wires in the twisted-pair transmission line carry equal and opposite currents, cross-talk radiation is held to a minimum. Likewise, the matched currents reduce ground-loop currents which can generate voltages that reduce the useful common-mode range of drivers and receivers in a system. Specifically, the MC75113 features a TTL-compatible four-input OR gate and output currents of nominally ±20 mA. Output current mismatch is a maximum of 3 mA. Propagation delay time is 25 ns.

Motorola leadership doesn't end when we sell you a radio.

The Motorola Parts Organization is vital to maintaining Motorola's world wide reputation as a leader in 2-way radio communications. We're dedicated to helping you maintain your system.

Over 35,000 parts are on file for everything we make, as well as what others make. Plus a complete line of test equipment.

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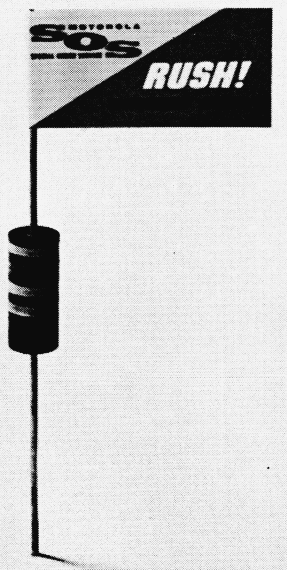
The quality you expect from Motorola communications systems is matched by our parts and test equipment. Send for your Buyer's Guide and Parts Handbook today. Write on your company letterhead to Motorola Communications & Electronics Inc., 1313 E. Algonquin Road, Schaumburg, Ill. 60172.

MOTOROLA TOTAL COMMUNICATIONS



Motorola's SOS Emergency Service—24 hours a day, seven days a week. We never close.

Circle 78 on Reader Service Card

New 25-Pair Cable Connector Simultaneously Cuts and Terminates 50 Communications Wires

In the communications industry, it is common to use preassembled 25-pair cables with a connector soldered on each end. Factory production results in high-quality connections but often the cables must be cut to odd lengths in the field where there is no convenient means of terminating the cables. Soldering 50 wires to a cable connector in the field is hardly an ideal situation.

An approach to this problem was met head-on by AMP, providing a connector that can be terminated in the field using any of several tools, thus providing a savings in both cables and connectors.

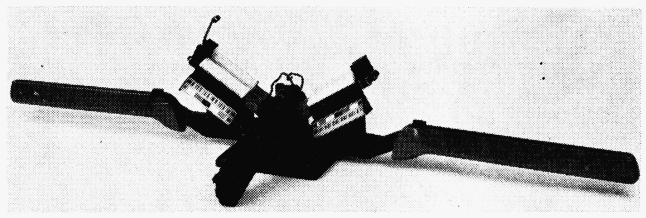
With a single stroke of the tooling, 50 wires are simultaneously cut to length and terminated to the CHAMP 25-pair cable connector.

Designed specifically for the 25-pair cables commonly used in the communications industries (including telemetry, telephone, computer terminal, and data peripheral interface), this new cable connector is intermateable and interchangeable with similar connectors currently in use. It has contacts that are readily removed and replaced if they become damaged.

These all-plastic connectors are molded from an SE-1 rated thermoplastic and can be furnished with or without an integral 90° cover and strain relief made of the same material. Located on 0.085-inch centers, the replaceable, preloaded contacts are gold-over-nickel-plated high-conductivity beryllium copper with dual-slot termination.

In the actual termination process, an unstripped wire is pressed into both contact slots by the specially designed tooling. The front slot of the contact completely displaces the insulation and extrudes the wire with a wiping action to assure intimate electrical contact, while the rear slot provides a lesser degree of extrusion providing insulation support and strain relief. Excess wire is automatically cut off during the terminating process by the tool.

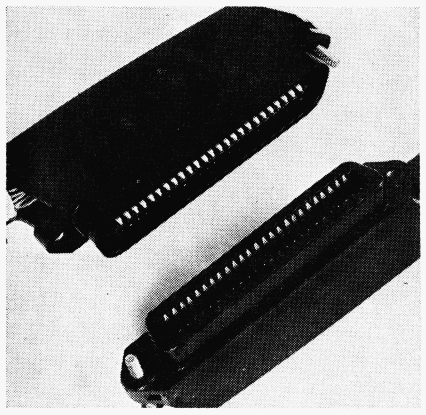
Wiring changes can be readily made in the field with a one-wire-at-a-time hand tool or with a portable hand-operated tool that simultaneously terminates and cuts to length all 50 wires. A high-speed semiautomatic power tool is available for production use. Even the bench-mounted hand tool is capable of producing 12 fully completed connectors in less than one hour.



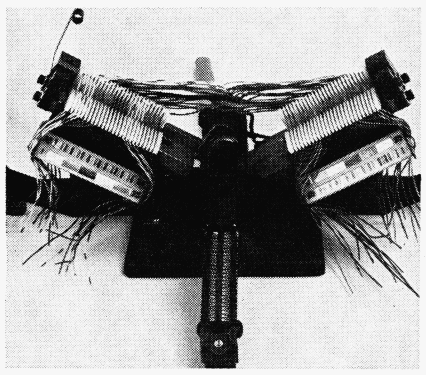
"Butterfly" hand tool open, ready to accept wires and connector.

For additional information on the CHAMP 25-pair cable connector, use the handy Reader Service Card or write *AMP Incorporated, Harrisburg, Pennsylvania 17105.*

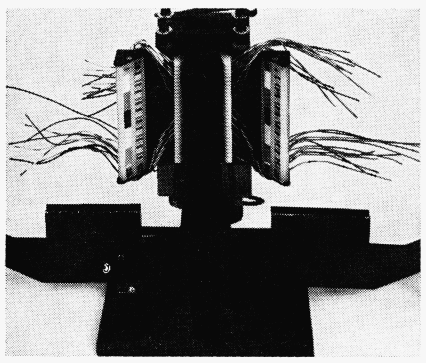
Circle 76 on Reader Service Card



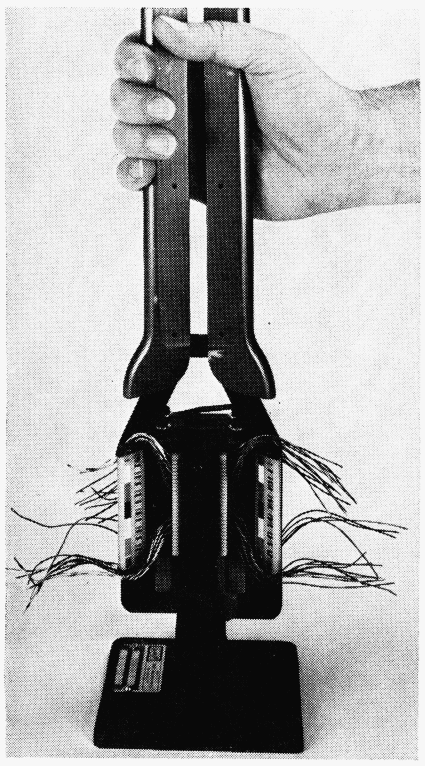
AMP's new CHAMP 25-pair cable connector.



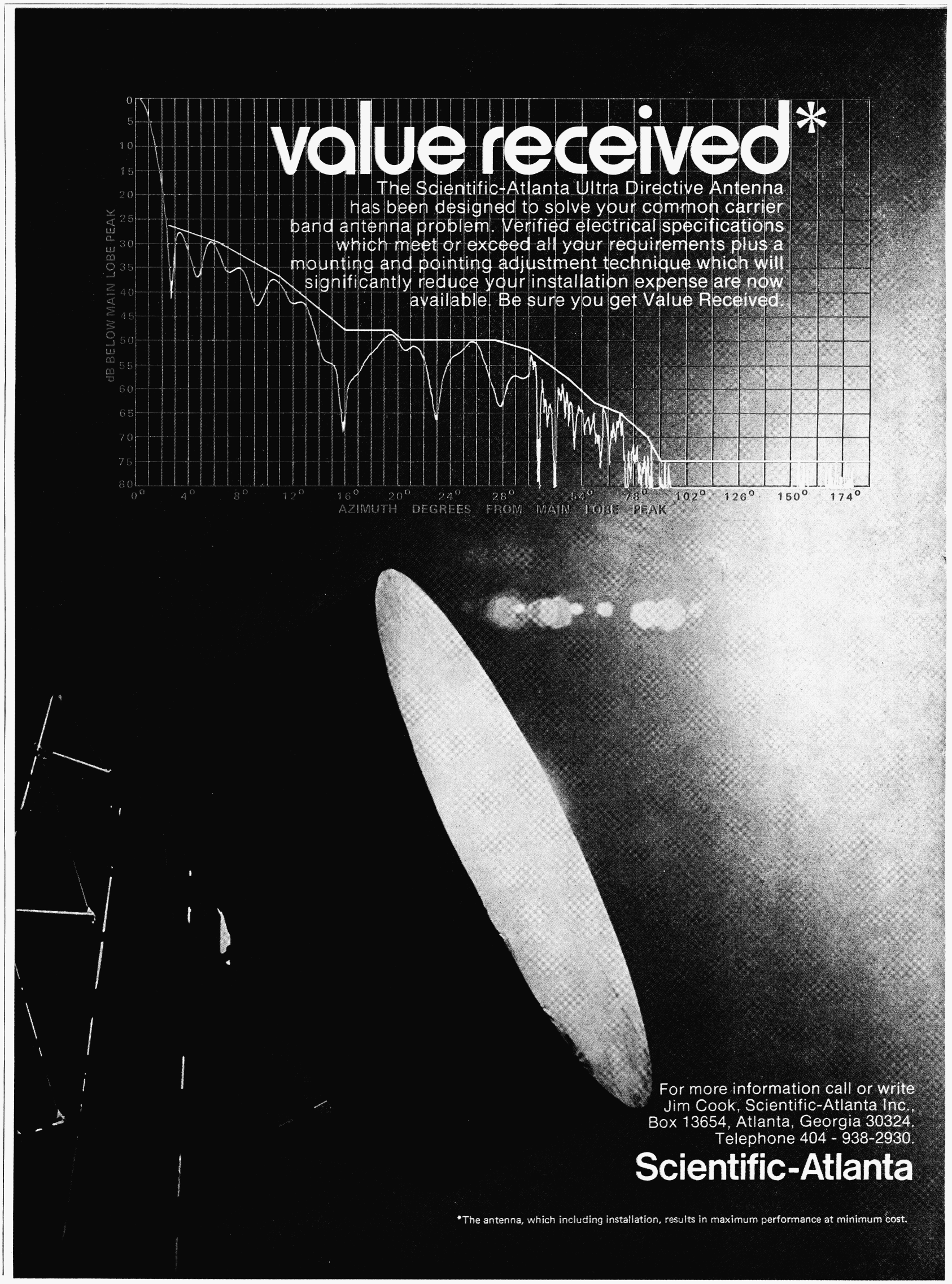
Connector inserted into tool and wires dressed in position.



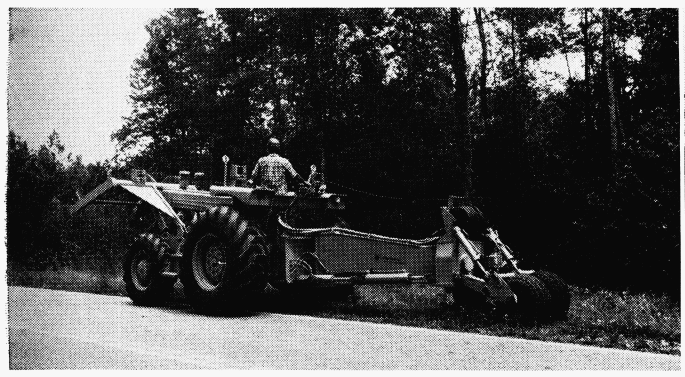
Connector and wire-holding fixture swung into place ready for termination.

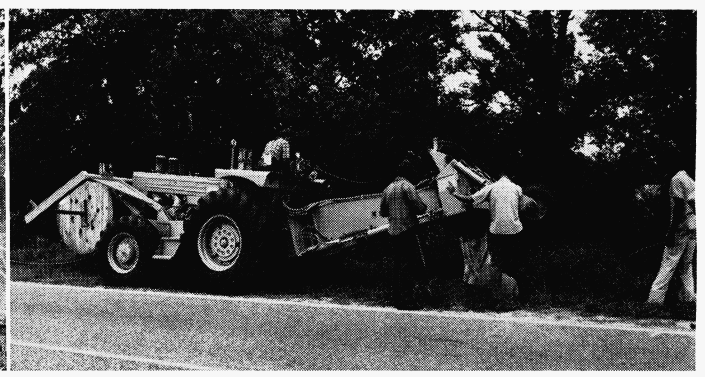


A single closing stroke of the handles completes the termination of all 50 wires.



Circle 79 on Reader Service Card





This "Saber Plow" did most of the work when United Telephone Systems of the Carolinas recently buried 35,000 feet of 50-pair, 19-gauge telephone cable in the Beaufort, South Carolina area. Plowing alongside an open highway (left), the DP-100 laid up to 15,000 feet of cable in one day. With the shiftable boom the operator offset the blade to meet his 36" from the road specs, and was still able to keep his wheels on the road. The center picture shows how the plow's shiftable boom and steerable blade allow it to maneuver around obstacles like this telephone pole. The picture at right shows how the boom and blade of the plow can be raised or lowered hydraulically to avoid previously buried gas-lines or other obstacles, or when a junction for the cable above the ground is needed.

"Saber Plow" Lays 15,000' of Cable per Day for United Tel of Carolinas

While underground installation of telephone cable is acknowledged to be the method of the future for supplying the best service, several problems do have to be overcome, as the United Telephone System of the Carolinas found when it decided to lay 35,000 feet of buried cable in the Beaufort area.

The job called for burial of 50-pair, 19-gauge telephone cable to service new developments in Pineland in the Ridgeland District, as well as to update existing service lines. The State Highway permit secured called for placement of the cable 36 inches from the road, with a tolerance of plus or minus six inches. Maximum cable burial depth was specified at 36 inches.

To accomplish the job, the company turned to the Ganier Telephone Construction Company of Burton, South Carolina, a contractor that does all the construction work for the company. Ganier did the majority of the work with a Parsons DP-100 Saber Plow, a self-propelled machine which features a large vibrating blade which literally saws vertically through the ground, feeding continuous cable out through its tip. It tamps the ground back to practically its original condition with two vibrating wheels mounted directly behind the blade.

Proves Value in Variety of Soil Conditions

Obstacles encountered by Ganier's seven-man crew included cross country gas-lines, theoretically set at a 48-inch depth (but actually varying somewhat), driveways, mailboxes and signposts, stumps, and roots. The soil conditions varied from sand to packed or gumbo clay.

Because the DP-100 has a shiftable boom and steerable blade, it was possible to plow on two-foot shoulders, as well as around mailboxes and signposts located four feet off the road.

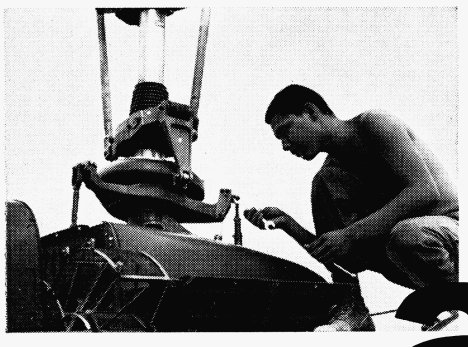
Due to the power available through the vibratory blade, roots were cut through as if they were not there. Neither did thick clay cause any problems. According to Bill DeBose, supervisor on the job, "We averaged 15,000 feet per day in the sand, but in the Holly Hills production was reduced to 10,000 feet, and that's not bad for going 36 inches deep in heavy clay. I've seen other outfits bring in two motor graders and an Army truck to pull a static plow through the clay. The vibratory action of the Saber Plow overcame these problems, and it can bury cable to a 42-inch depth."

Other Equipment Also Used

The plow is made by the Parsons Division of Koehring Company in Newton, Iowa. Backing up the plow, Ganier used a Davis 30+4 trencher for driveways and terminal or feeder station loops; a John Deere 300 backhoe for wet areas and ditches; and a Mighty Mole for boring up to 2½-inch openings under the highways.

A set of vibrating tamping wheels behind the blade compact the soil back in place so completely that the cut for the cable is nearly invisible. The rig's rubber tires do no damage to the road surface.

Hire the veteran. Hire ability.



The ability to do a job well. To learn. To take orders. And to give them. ■ The Armed Forces spend over $3 billion yearly on training servicemen. That means many veterans have skills *you* can use from the moment they're hired. And if they need further training, monthly allowances under the GI Bill can supplement their wages while they are in approved training programs. ■ Hire veterans. Put their ability to work. ■ For help in hiring veterans, contact your local office of the State Employment Service; for on-the-job training information, see your local Veterans Administration office.

Don't forget. Hire the vet.

JOBS FOR VETERANS

ADVERTISING COUNCIL

Questions

Your communication questions answered by experts

QUESTION: *Can a Telpak network be changed without affecting the physical operation of the communications circuits?*

ANSWER: A Telpak user may uncover a less expensive routing and, because Telpak exists only on paper, he may then specify route changes to AT&T. The physical operation of the communications circuits is not affected, since Telpak is only a billing device.

QUESTION: *We are having difficulties in detecting and analyzing "whistlers" (low-radio-frequency emanations from lightning and other electromagnetic phenomena) because background noise levels are often higher than whistler signal strengths. How can we overcome these difficulties?*

ANSWER: You might try recording the output of your spectrum analyzer (presumably it is similar to the Rayspan unit) with a graphic recorder such as the Alden 5-inch component recorder. Whistlers will usually be presented as curving peaks within a monitored range from about 50 Hz to 10.5 kHz. Integration capability of the recorder (300 lines/inch for the Alden recorder), plus the inherent integration of Alfax paper by tone shade response in shade variation at the end of the color spectrum where the human eye-brain reaction is most efficient in interpreting slight tone shade changes, should capture the whistlers in spite of high noise level.

QUESTION: *Why is a high instantaneous dynamic range important in MACSEM 5100 TEMPEST TEST receiving systems?*

ANSWER: In any receiving system, but especially in TEMPEST TEST receiving systems, dynamic range is a key parameter. A particularly difficult receiving frequency range is 100 Hz to 1 MHz, where unshielded ambient noise intensity is very high, and adequate shielding is impractical. In a high noise ambient, the receiving systems sensitivity becomes equal to the ambient level minus the receiving system dynamic range, which is invariably higher than KTB noise. A key parameter in specifying the performance of a broadband-signal receiver is the instantaneous dynamic range as opposed to the CW dynamic range.

QUESTION: *How is a stroboscope triggered by a photoelectric electric pickoff?*

ANSWER: Photoelectric pickoffs use light to create an electrical signal that, in turn, triggers the strobe. Several styles are available. One style consists of a light source and a photocell housed in a single unit. The light is aimed at the path of a piece of reflective tape attached to the device. As the tape moves past the light, the reflection back to the photocell causes the strobe to flash. Another style consists of a light and cell housed in two different units, mounted so that the light is aimed at the cell. The object under study moves between the light and the cell and alternately blocks the light to the cell and then allows it to pass.

QUESTION: *When selecting discrete transistors for use in CATV amplifiers, what characteristics must be considered?*

ANSWER: The stringent requirements placed on CATV amplifiers set heavy demands on the performance of the individual transistors. The low-distortion specifications spell out ultralinear operation, often requiring biasing at high current levels with the disadvantage of high power dissipation. Transistors must be designed, tested, and specified for low cross-modulation and intermodulation distortion if they are to be used in CATV systems. Often push-pull output stages are employed to achieve the required distortion figures. Broad-bandwidth amplifiers require transistors with high f_T and low R_bC_c time constants. Likewise, the system signal-to-noise ratio requirements set specifications for a very low noise figure on the preamplifier transistor. Representative of the transistor types available for CATV distribution amplifiers and trunk-line amplifiers are the Motorola 2N5943 and 2N5947. The 2N5943 has typical cross modulation of −67 db at +40 dBmV (at 50 mA), a maximum noise figure of 8 dB, a minimum f_T of 1200 MHz at 50 mA, a TO-39 case. The 2N5947 has maximum cross modulation of −57 dB at +50 dBmV, a maximum noise figure of 8.5 dB, a minimum f_T of 1100 MHz at 75 mA, and a 144D-04 case.

QUESTION: *Is it necessary that a bandpass filter being measured be terminated in attenuators?*

ANSWER: When measuring a bandpass filter, both ends must be terminated in attenuators, because the filter impedance is resistive in the pass band, reactive in the stop bands, and resistive and reactive in between pass and stop bands. Otherwise, the reactance of the filter would combine with the impedance of the generator and measuring instruments to produce errors.

New Device Prints 8,000 Lines per Minute on Ordinary Paper

A new computer output device has just been introduced which prints 8,000 lines per minute on ordinary paper. The EPI-100 printer uses a unique electrostatic method of depositing ink in a dot matrix directly onto paper. It prints in a number of upper and lower case fonts, as well as graphics and foreign languages.

The speed of 8,000 lines per minute is independent of line length, size of character set or code set. Ink costs are said to be lower than impact ribbon costs and multiple copy jobs can be printed sequentially, eliminating carbon paper and decollating.

The EPI-100 printer may be used off-line or on-line. Controllers for interfacing with major computer manufacturers' equipment will be available with first deliveries.

In addition to the high speed (four times faster than the IBM 3211) and low operating costs, the EPI-100 printer is highly reliable with fewer moving parts than conventional printers. The printing operation is extremely quiet since the noise of print hammers is eliminated.

The single-step printing process provides text which is immediately visible.

Standard form information can be printed simultaneously with the data. Any type of alphanumerics and graphics can be printed at 100 dots per inch resolution.

Print line width is 136 characters and character spacing is 10 characters to the inch. Line spacing is six lines to the inch.

The type font is a 7 x 10 matrix (contiguous dots) and the character set is upper case alphabet with numerics and common symbols. The character code can be ASCII or EBCDIC.

Paper is sprocket fed fan fold, with variable width 3.5 to 16 inches.

Options include form control, multiple fonts (electronically selected), and graphics print width.

For more information use the handy Reader Service Card in this issue or write *Electroprint, 10061 Bubb Road, Cupertino, California 95014.*

For more info circle 114 on Reader Service Card

Electroprint has just introduced this EPI-100 printer which prints 8,000 lines per minute on ordinary paper.

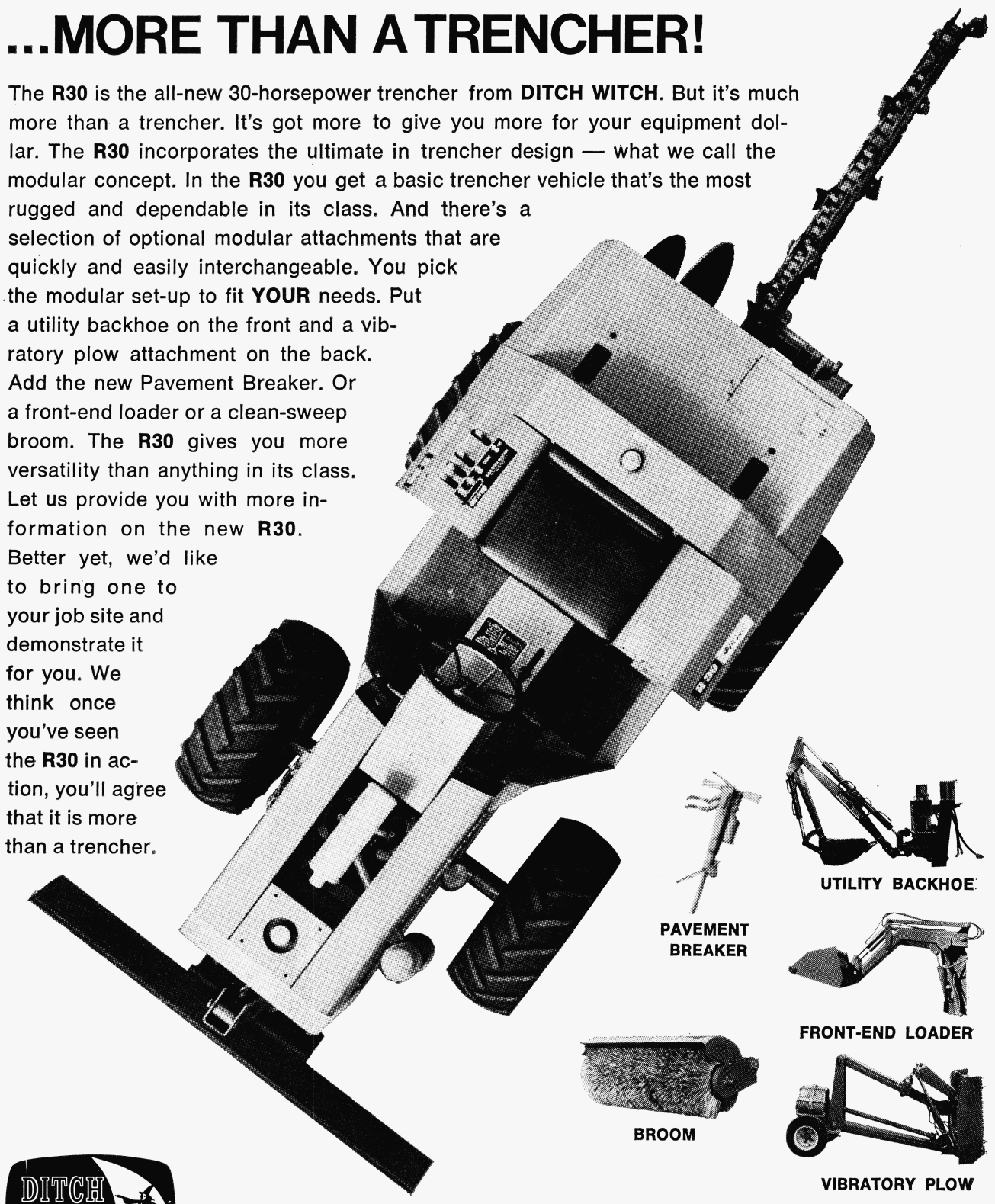
Close-up of the EPI-100 printing head which uses an electrostatic method of depositing ink in a dot matrix directly onto paper.

INTRODUCING THE ALL NEW...

DITCH WITCH R30

...MORE THAN A TRENCHER!

The **R30** is the all-new 30-horsepower trencher from **DITCH WITCH**. But it's much more than a trencher. It's got more to give you more for your equipment dollar. The **R30** incorporates the ultimate in trencher design — what we call the modular concept. In the **R30** you get a basic trencher vehicle that's the most rugged and dependable in its class. And there's a selection of optional modular attachments that are quickly and easily interchangeable. You pick the modular set-up to fit **YOUR** needs. Put a utility backhoe on the front and a vibratory plow attachment on the back. Add the new Pavement Breaker. Or a front-end loader or a clean-sweep broom. The **R30** gives you more versatility than anything in its class. Let us provide you with more information on the new **R30**. Better yet, we'd like to bring one to your job site and demonstrate it for you. We think once you've seen the **R30** in action, you'll agree that it is more than a trencher.



PAVEMENT BREAKER

UTILITY BACKHOE

FRONT-END LOADER

BROOM

VIBRATORY PLOW

DITCH WITCH

A Division of

CHARLES MACHINE WORKS, INC. P.O. Box 66 Perry, Oklahoma 73077

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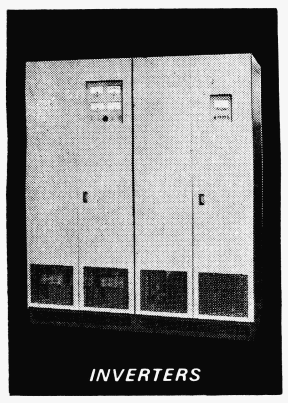

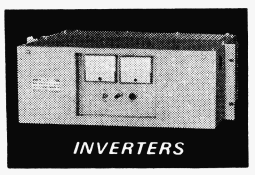

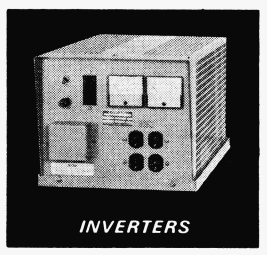

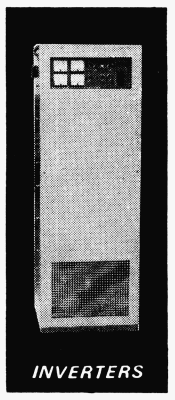

THE LORAIN UPS SYSTEMS

Provide regulated, precise, uninterrupted power to critical AC loads while protecting them against AC line failures. Lorain UPS-protected loads are unaffected by line problems including low voltage (brownout), transients (flickout) and complete failure (blackout). Additionally, intra-redundant systems protect against internal, random failure within the UPS itself. Lorain UPS systems are expandable to handle future load requirements.

...AND MORE INVERTERS! CHOOSE FOR ECONOMICAL, RELIABLE STANDBY POWER

■ Inverters and Inverter Systems from 125 to 2,000 VA single-phase or 5,000 VA to megawatt three-phase output ■ Inverters with 24, 48 or 130 volt battery input ■ Inverters with no-break sine-wave redundancy ■ Inverters with 1/10 second automatic transfer ■ Inverters with manual transfer ■ Inverters for main power — transfer to commercial AC line upon loss of inverter output ■ Inverters for standby power — marginal time delay release on restoration of AC line.

FIRST... *by Design*

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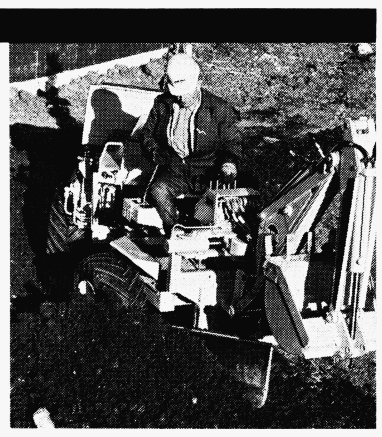
Circle 82 on Reader Service Card

When your jobs call for a heavyweight with finesse, you need the Davis Fleetline 40+4!



The Fleetline 40+4 gives you extra lugging power!

You get power plus in the Davis Fleetline 40+4, and about 40% more strength than found in 30 hp trenchers. You get strength where it's needed—in the head shaft, jack shaft, digging chain, clutch and sprockets, and in the frame—to handle the extra torque and lugging power of the 37 hp Wisconsin gasoline or 36 hp Deutz diesel engines, available as factory options. The 40+4 incorporates all the design features that have made Davis the industry's leader. The one-hand Mono-Stick, four-wheel Hydra-Static drive, limited-slip differentials and hydraulic articulated steering let you move over the terrain with finesse! Your 40+4 can be equipped with an angle dozer, the famous SD-100 backhoe or the P-60 direct-burial Line-Layer, and the Hydra-Borer to give you the most complete underground system in the 35 to 40 hp class! To get the facts, see your Davis Trencher dealer, or write Davis Manufacturing Division of J I Case Company, 1500 South McLean Blvd., Wichita, Kansas 67213

DAVIS COUNTRY — EVERYTHING UNDERGROUND

DAVIS Underground Systems for the 70's!

FL40-1-272

Circle 83 on Reader Service Card

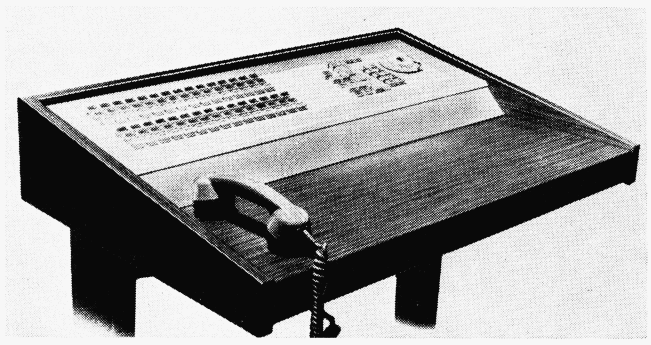
New Items

New products with more information available

A HANDY, EASY WAY to request additional information about any of the new products or free literature shown on pages 82 thru 96 is simply to circle the appropriate number on the Reader Service Card opposite page 98.

Limited Direct Inward Dial PABX with Standard Two-Way Trunks

The 1200 Series of medium-capacity PABXs is available in two different configurations: the Series 1223 with a maximum of 200 stations and 30 trunks and the Series 1246 with a maximum of 400 stations and 60 trunks. Standard features include three classes of service, consultation call, call transfer (on both received and originated calls), three-way station-controlled conference, automatic



camp-on, series call, automatic attendant recall, two-way splitting of trunk call, trunk control, universal and assigned night answer, and others. Dustproof cabinets are used to house the crossbar switches, plug-in trunks, lines, and other related switching equipment. Use card or write *Reliable Communications Products Company, 11411 Addison Street, Franklin Park, Illinois 60131.*

For more info circle 115 on Reader Service Card

Loran Receiver Compares Signals from Two Pairs of Stations, Displays Readings

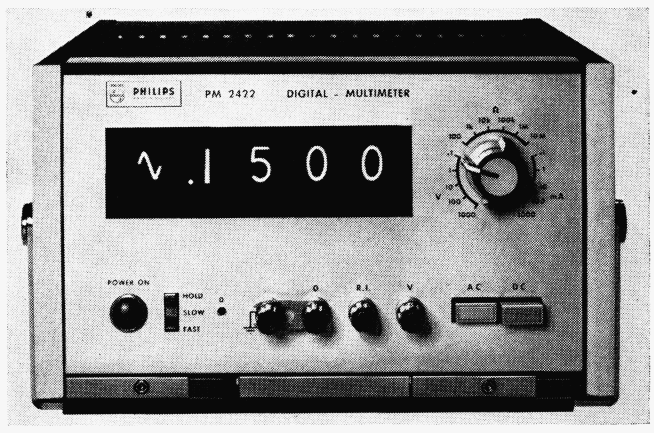
The Model NA-115 loran receiver seeks out the signals from any two pairs of standard loran stations. The aid then continuously compares the signals electronically and displays the readings on the face of the instrument. These

readings represent preprinted lines of position on offshore navigation charts. The unit is intended for use by offshore boatmen. Use card or write *Raytheon Marine Company, 676 Island Pond Road, Manchester, New Hampshire 03103.*

For more info circle 116 on Reader Service Card

Digital Voltmeter Has Three-Digit Resolution and Over-Range Digit

The Model PM2422 digital voltmeter is a "3 + 1" instrument with three-digit resolution and an over-range digit in any of five ranges of AC or DC current and voltage and in six ranges of resistance. Accessories extend the PM2422 measuring capabilities to 800 MHz for RF potentials as high as 16 V rms, to 30 kV DC, and to 100 A at 400 Hz. The PM2422 is an integrating DVM and is therefore



capable of accurate measurements in the presence of large superimposed noise amplitudes. Integrating period is 20 ms. Measurements may be made either grounded or floating. Common-mode rejection is 100 dB for DC and 90 dB at line frequency. Use card or write *Test & Measuring Instruments, 224 Duffy Avenue, Hicksville, New York 11802.*

For more info circle 117 on Reader Service Card

Telephone Activity Identification System

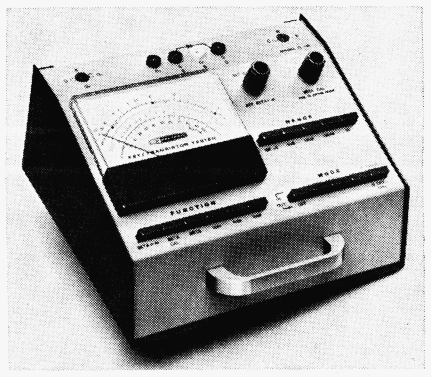
The TELAID telephone activity identification system identifies calls by extension, allocates telephone costs by departmental cost center, eliminates operator manual ticketing, analyzes traffic, and verifies telephone company toll billing. The system records all digits dialed, the date and time of

events, length of call, and the number of rings on incoming calls. The TELAID handles from one to many thousand stations/trunks and is touch tone and rotary dial compatible. Use card or write *Cal Systems, 6660 Reseda Boulevard, Reseda, California 91335.*

For more info circle 118 on Reader Service Card

FET Tester Checks in or out of Circuit

The Model IT-121 FET tester is designed for checking transistors, diodes, FETs, SCRs, triacs, and unijunction transistors in or out of circuit. Five current ranges measure leakage as low as 1 μA and collector currents as high as 1A. Gain (DC Beta), transconduc-

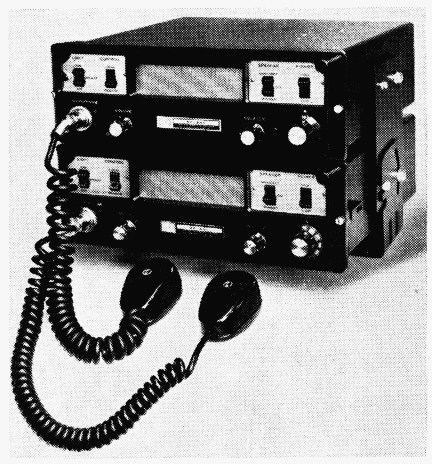


tance (GM), and leakage values are read directly on large meter face. The tester offers color-coded pushbutton range selection, battery-testing circuit, and handy 3-foot leads. Use card or write *Heath Company, 305 Territorial Road, Benton Harbor, Michigan 49022.*

For more info circle 119 on Reader Service Card

Dual Marine Transceiver System

The Type RF-4402 dual-transceiver system combines two standard, field-proven RF-401 Series units in a convenient stacked configuration. The system is designed for rugged commercial marine service. It offers 24-channel capacity, a receiver with special "muting" circuitry, two 25-W

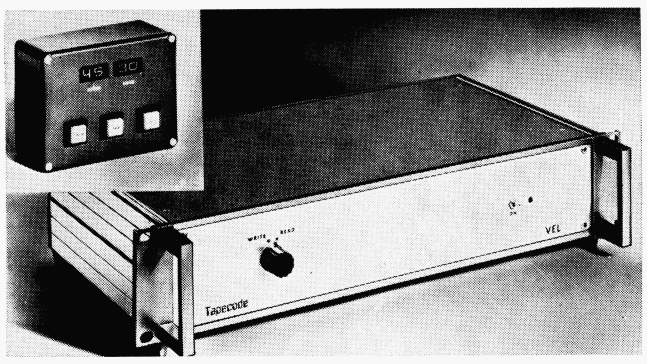


transmitters, and 4-W audio. The dual transceivers of the RF-4402 may be programmed for simultaneous monitoring of Channels 13 and 16. Use card or write *RF Communications, 1680 University Avenue, Rochester, New York 14610.*

For more info circle 120 on Reader Service Card

Digital System Records Numerical Info on Every Frame of a Video Tape

The Tapecode digital information system records individual numerical information on every frame of a tape without interfering with the picture content, and a solid-state display panel exhibits the data during both record and playback modes. Recordings can be made on any videotape machine and replayed on any other compatible unit. Numerals may be elapsed time, 24-hour clock time, digital counts up to 99,999,999, or binary-coded output from a

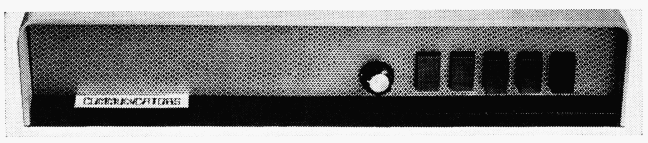


computer, teletape, or digital instrument. Without altering the recorder, the system can be extended with a Cuecode unit to operate mechanical or electronic switches automatically at presettable points of the tape to initiate external sequences, such as machine start or projector changeover. Use card or write *Denlen Electronics Corporation, 23 Guardsman Road, Thornhill, Ontario, Canada.*

For more info circle 121 on Reader Service Card

Single-Unit Hands-Free Telephone Accessory

The ISI/Communicator I is a single-unit telephone accessory which provides for total hands-free communication from any telephone, business or residential. It is completely solid-state and its electronic circuitry and voice-switching system allow the user to be up to 50 feet away and still speak in a normal tone of voice. A bridging net-

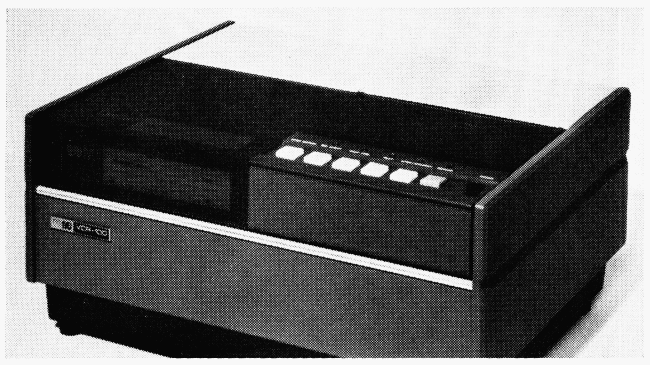


work has been engineered into the unit which makes it possible to arrange multiparty conferences over trunks or other outside lines and still maintain the unit in a hands-free mode. Use card or write *The Communicators Corporation, 2710 Forest Lane, Dallas, Texas 75234.*

For more info circle 122 on Reader Service Card

Color Video Cartridge Recorders

The VCR-100 Series of color video cartridge recorders uses self-threading one-inch video tape cartridges that are tape interchangeable with the more than 10,000 videotape recorders that the company manufactures. The unit operates on either standard or high energy video tape. Head life warranty has been extended to 2,000 hours because the head is only in contact with the tape during play and rec-

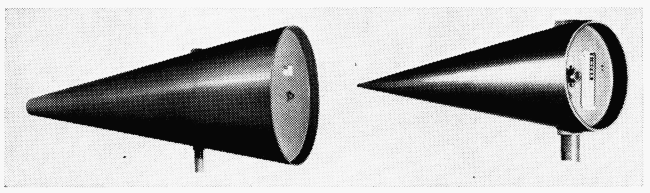


ord modes. A direct drive scanner, capstan servo, and three motors insure high time base stability. A second audio or cue track is standard. Three models are available; all models record in color. Use card or write *International Video Corporation, 675 Almanor Avenue, Sunnyvale, California 94086.*

For more info circle 123 on Reader Service Card

Conical Log-Spiral Antennas Cover 0.2-1 GHz and 1-10 GHz

Conical log-spiral antennas cover 0.2 to 1 GHz and 1 to 10 GHz for radiation susceptibility testing to MIL-STD-826/461. The largest dimension of the larger antenna is only 34 inches. Models 93490-1 and 93491-2 are supplied with calibration curves and exhibit high back-lobe sup-

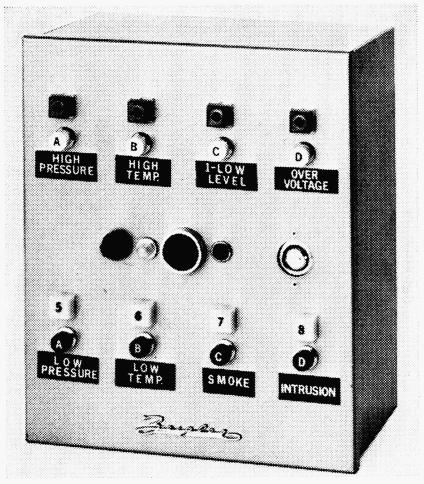


pression and circular polarization. The broadband antennas require no switching, tuning, or other adjustment over their respective ranges, and are said to be ideal for automatic EMI measurements. Use card or write *Singer Instrumentation, 3211 South LaCienega Boulevard, Los Angeles, California 90016.*

For more info circle 124 on Reader Service Card

Annunciator and Control Panels

Custom-designed annunciator and control panels are manufactured with computer-tape integrated circuitry for high reliability, and may include visible alarm indications with flashing lights, audible alarm indications with loud pulsing beepers, or any combination of both. Controls for correction of the alarm condition may also be specified. Alarm situations to be monitored may include temperature, air or liquid flow, existence or absence of liquids, smoke, intrusion, over voltage



or transients, or any other detectable condition. Use card or write *Zeigler Controls, 17810 South Western Avenue, Gardena, California 90248.*

For more info circle 125 on Reader Service Card

Low-Band Pocket-Size Two-Way Radio

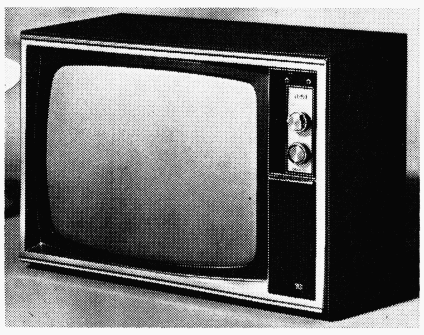
A new low-band pocket-size "PE" Series two-way radio is designed for use either as a hand-held radio or to be plugged in a car. The new units, with 2-W output power from 30 to 50 MHz, become part of the PE Series family which also includes models in 138-to-174-MHz, 406-to-420 MHz, and 450-to-512-MHz ranges. Powers

vary according to frequency range. One model is available with one or two frequency operation. Another provides from one to eight channels. Use card or write *General Electric Communication Systems Division, Section P, Post Office Box 4197, Lynchburg, Virginia 24502.*

For more info circle 126 on Reader Service Card

Utility Color TV Monitor

The Model JR-968W commercial Accu-Color TV receiver is designed to serve as a general-purpose utility monitor for numerous studio applications, including direct off-air monitoring functions. The receiver is equipped to accept RF or bridged direct TV video and audio line feed without the costly adaptors required when entertainment-type TV sets are

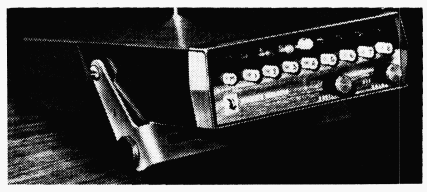


used. In addition, it includes a separate 75-ohm video input for direct off-air recording. Other features include automatic fine tuning, automatic chroma control, color kinescope, Accu-Tint, 25,000-V chassis, and others. Use card or write *RCA Service Company, Department 1614, Building 203-3, Camden, New Jersey 08101.*

For more info circle 127 on Reader Service Card

VHF and UHF Scanning Monitor Receiver

A new Duo-Scan scanning monitor receiver covers both high-band VHF and UHF channels and has dual ceramic filters. Included in these frequency ranges are police, fire, mobile telephone, railroads, trucking, and many other services. The eight channels can be set up on any combination of VHF and/or UHF with simple

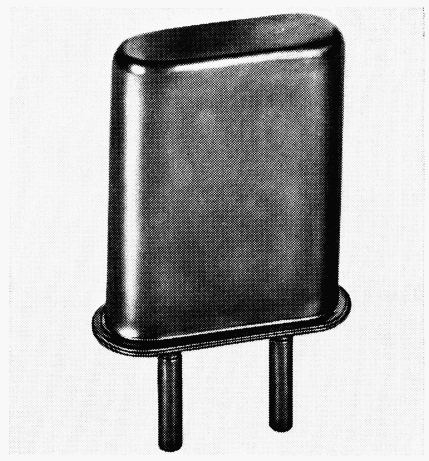


jumper plug changes, requiring no soldering. In addition to auto-scan, the radio provides lock-out switches to bypass channels, as well as manual operation for continuous monitoring of a single channel. Use card or write *E. F. Johnson Company, 8250 Tenth Avenue, Southwest, Waseca, Minnesota 56093.*

For more info circle 128 on Reader Service Card

Coldweld-Packaged AT-Cut Crystals

A line of coldweld-packaged AT-cut crystals are specifically designed to overcome problems of off-frequency communication violations. The AT coldwelds feature a stability of 2 PPM for ±5°C of the zero coefficient point, and aging characteristics of 1 PPM/Mo. They come in a miniature HC-25/U coldweld equivalent con-



figuration; are available in fundamental, third, fifth, and seventh overtones; and have coldweld seals eliminating contamination and frequency shift caused by solder flux and heat. Use card or write *Bulova Watch Company, Electronics Division, 61-20 Woodside Avenue, Woodside, Long Island, New York 11377.*

For more info circle 129 on Reader Service Card

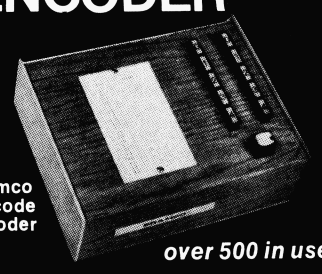
Two-Way CATV Distribution Amplifiers

The Series 6500 line of two-way distribution amplifiers employs hybrid integrated circuits in all units. Downstream signals are transmitted in the 54-300-MHz band while upstream signals are transmitted between 5-108 MHz. A single housing contains all circuit modules including forward and

return amplifiers, bridging amplifier, dual-pilot AGC, and power supply. Packaging techniques enable the amplifier housings to be opened in either direction with respect to signal flow. Use card or write *Scientific-Atlanta, Incorporated, Post Office Box 13654, Atlanta, Georgia 30340.*

For more info circle 130 on Reader Service Card

THE $195.00 PAGING ENCODER



Bramco 25-code encoder

over 500 in use

- Generates the same two-tone sequential codes used in popular paging receivers sold by these companies: Aerotron, E. F. Johnson, Bell & Howell, CMC, Cook, G.E., Karr, Motorola, RCA, ITT, Standard Communications, Symetrics, Unimetrics . . .
- As a selective call encoder, it's completely compatible with *GE Type 99* and *Motorola Quik Call II.*
- Operates from 117 VAC or 12 volt battery for mobile calling.

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versatile new

14-Piece, ¼" Sq. Drive

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drives fasteners 7 different ways

REVERSIBLE RATCHET — Precision made, long life, fully enclosed mechanism. Short handle swing for close quarter work.

UNIQUE SPINNER/EXTENSION — 5-3/4" overall. Plastic (UL) handle with 1/4" sq. drive socket insert for ratchet. Use also as regular nutdriver.

2" DRIVE EXTENSION — Fits on ratchet or either end of spinner/extension.

RUGGED, HEAT TREATED, ALLOY STEEL SOCKETS — Nine for hex sizes 3/16" thru 1/2". Two dual purpose for hex and square sizes 1/4" and 5/16".

FREE STICK-ON INITIALS personalize the sturdy plastic case and help prevent loss or mix-up.

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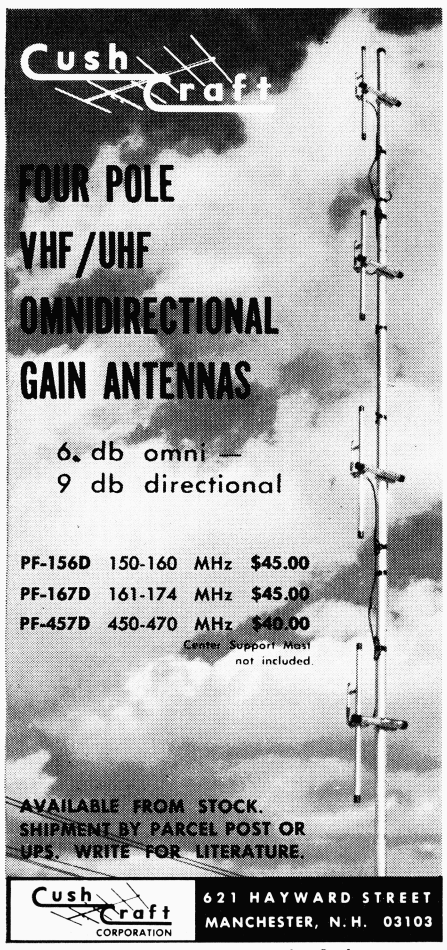
XCELITE, INC., 140 Bank St., Orchard Park, N. Y. 14127
In Canada contact Charles W. Pointon, Ltd.

Circle 85 on Reader Service Card



Circle 86 on Reader Service Card

Unique new study analyzes business opportunities in the booming

CATV MARKET

This new Frost & Sullivan 250 page report is designed to help qualified firms capture a share of this market — study forecasts growth to 23.4 million CATV subscribers (homes) generating subscription income of $1.97 billion by 1980.

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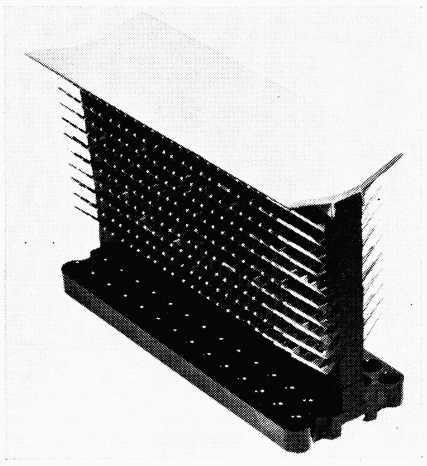
Circle 87 on Reader Service Card

New Items...

Continued from previous page

20-Pin, 12-Row Terminal Block

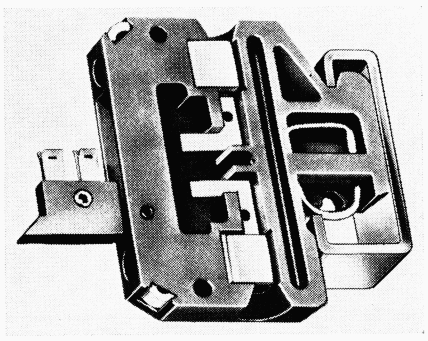
The 20-pin "Christmas Tree" terminal block offers up to 12 rows of 20 solder-to-solder or wrapped-to-wrapped terminals. Molded of extra tough, black, thermo-set plastic, the terminal blocks meet military specifications MIL-F-14F. Terminals are brass, electroplated with tin alloy. For larger applications, such as line terminal blocks in Central Offices, the 26-pin block provides up to 12 rows of 26 terminations. Use card or write *ADC Products, 4900 West 78th Street, Minneapolis, Minnesota 55435.*



For more info circle 131 on Reader Service Card

Terminal for Testing and Signaling Circuits

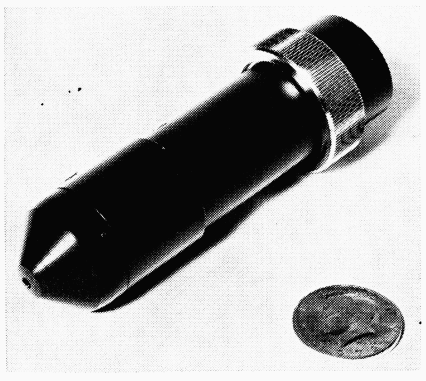
A terminal designed for use in testing and signaling circuits, designated Type SAKR, uses a knife-blade contact to complete the circuit. Lifting the hinged tab withdraws the blade and disconnects the circuit. The disconnecting tab is recessed in the terminal molding to prevent casual operation. All current-carrying parts are silver-plated brass. The SAKR test terminal is rated at 10 A, 250 V, and is CSA listed. Recessed screw clamp terminals will accept AWG wire sizes 18 through 12, either solid or stranded. Use card or write *Electrovert, Incorporated, 86 Hartford Avenue, Mount Vernon, New York 10553.*



For more info circle 132 on Reader Service Card

TV Camera Lens Has 14-mm Focal Length

A new TV camera lens offers a focal length of 14 mm; a size of ⅔ vidicon standard, "C" mount; maximum aperture of f4; and a front-entrance pupil of 0.130 inch. The lens is intended for use with concealed and protected cameras and requires only an aperture of slightly over ⅛ inch. At present the lens is being made for the ⅔ vidicon size, but will eventually be available for 1-inch vidicons and in two focal lengths of 14 mm and 9 mm. Use card or write *Power-Optics, Incorporated, Post Office Box 266, Fairview Village, Pennsylvania 19409.*



For more info circle 133 on Reader Service Card

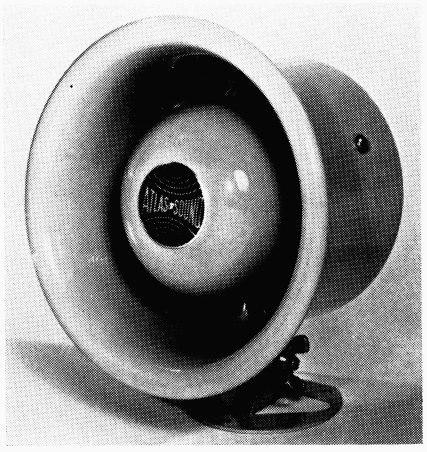
Portable Hydraulic Work Platform

The Model 7-710 portable hydraulic work platform can be custom-tailored to mount in the back of a truck. It is also available with skid, caster, or wheel mountings. The 7-710 platform elevates to nine feet and has a load capacity of 750 pounds. The unit shown is powered by an air-cooled gasoline engine, but other power options are also available. Use card or write *Sky Witch Industries, 412 Northwest Fifth, Oklahoma City, Oklahoma 73102.*

For more info circle 134 on Reader Service Card

All-Metal Outdoor Reflex Speaker

The Model WR-5 all-metal outdoor reflex speaker is introduced for such residential installations as patios, barbeque areas, and pools. In addition to background music, radio, or TV audio reproduction, the speaker can be used as a sensitive microphone for intercom talkback and monitoring applications. Technical specifications include a program power of 7.5 W, frequency range of 375-10,000 Hz, sound level of 105 dB, and an impedance of 8 ohms. Use card or write *Atlas Sound, 10 Pomeroy Road, Parsippany, New Jersey 07054.*



For more info circle 135 on Reader Service Card

VHF/FM Monitor Receiver with Squelch

The DUO-VOX is a true VHF/FM monitor receiver with externally adjustable squelch control. The DUO-VOX is a high-performing, lightweight, and completely portable unit that will permit constant contact with people in the field. Features include externally adjustable squelch, 146-to-160-MHz range, built-in antenna, and two-channel option. Use card or write *Unimetrics, 23 West Mall, Plainview, New York 11803.*

For more info circle 136 on Reader Service Card

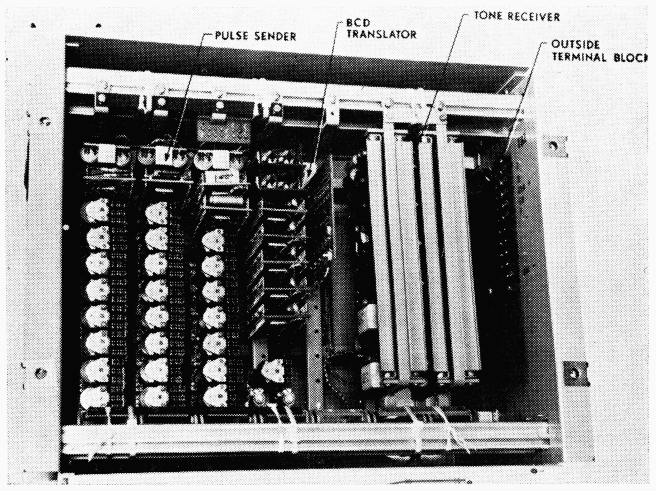
Security Devices Include Volumetric Intrusion Detectors

A broad line of security devices includes sophisticated volumetric intrusion detectors employing Doppler techniques and utilizing ultrasonic and microwave frequencies. The intrusion detectors will detect the motion of any mass in three-dimensional space. Their detection range is as much as 30 feet and a number of these detectors can be combined to cover larger areas. A stress intrusion detector is available which uses a small solid-state sensor glued to any structural member likely to flex when someone walks across it. The device senses minute amounts of structural bending and will work on any beam, stair riser, and even metal steps. Other models are offered. Use card or write *Detectron Security Systems, Incorporated, Bay Street, Sag Harbor, New York 11963.*

For more info circle 137 on Reader Service Card

Tone-to-Dial-Pulse Converter for Single-Line Tone Service

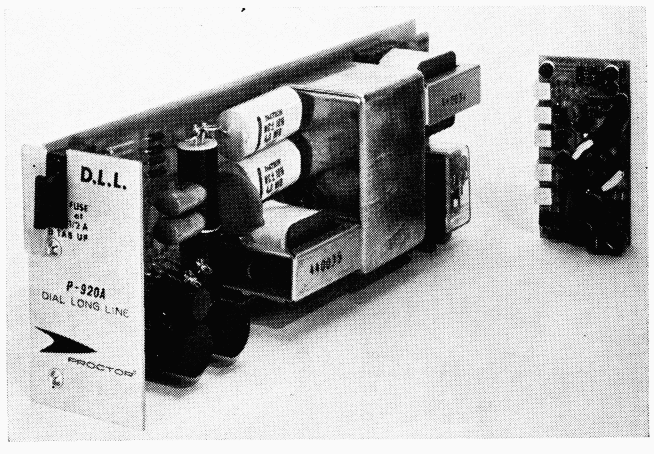
The Series 6000 tone-to-dial-pulse converter permits utilization of existing dial-pulse equipment to service tone telephones. Applicable in situations where single-line tone service is desirable, the Series 6000 converter can be used equally well on a full-time basis for limited or special subscribers in applications where complete change out to full tone service is not warranted. The single-channel converter consists basically of a tone receiver, a BCD translator, and a pulse sender. Seven discrete frequencies are used; for each of the 10-digit keys depressed on the tone telephone instrument, a coded (two out of seven) composite frequency output is produced. Use card or write *North American Philips Corporation, Communications Systems Division, 100 East 42nd Street, New York, New York 10017.*



For more info circle 138 on Reader Service Card

Dial Long-Line Unit Extends Central-Office Operating Range

The Model P-923A dial long-line unit expands the central-office operating range. The unit may be used for single-party or multiparty lines where ANI is required for billing purposes. Incorporation of an inexpensive battery-booster attachment provides service to 5,000-ohm subscriber loops. Transformer and balance coils minimize induced line noise. A balanced 900-ohm termination is provided to the idle loop. Ringing is repeated or by-passed to the loop and ring trip occurs during the silent or ringing interval. The unit allows 384 dial long lines to be mounted in a 23-inch by 11-foot, 6-inch relay rack. Use card or write *Proctor and Associates Company, 15050 Northeast 36th Street, Redmond, Washington 98052.*



For more info circle 139 on Reader Service Card

All-Solid-State PABX for Installation of up to 164 Lines

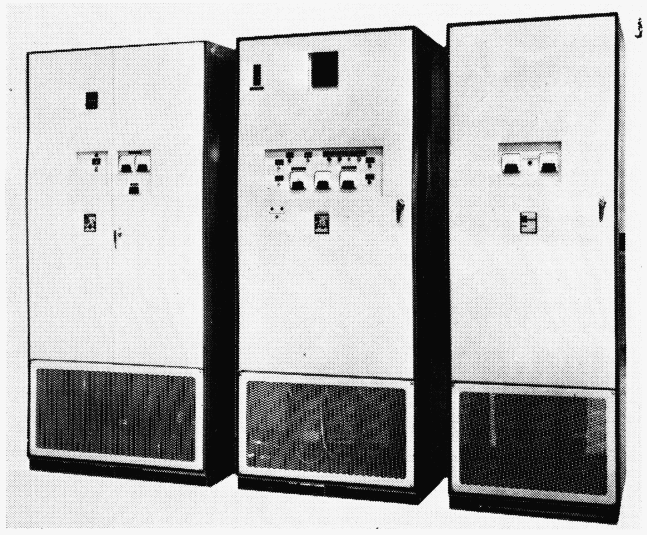
An electronic, all-solid-state PABX called the T/R System 32 is intended for installation of up to 164 lines. All common control switching equipment, station, and console components are electronic, and cable and power controls are housed in an enclosure the size of a four-drawer file cabinet. The number of extensions can be increased by

merely inserting into the system a 4-inch by 8-inch solid-state circuit card. If a failure should occur, a built-in diagnostic program activates a light at the console pinpointing the faulty printed-circuit board. Use card or write *Tele/Resources, Incorporated, One North Broadway, White Plains, New York 10601.*

For more info circle 140 on Reader Service Card

Single-Phase Static Uninterruptible Power Systems

A line of single-phase static uninterruptible power systems includes static-switching bypass-type uninterruptible power systems with 40 and 50-kVA single-phase, two-wire output. The units are designed to maintain operation of data-processing computers, communications systems, industrial process-control systems, and other sophisticated

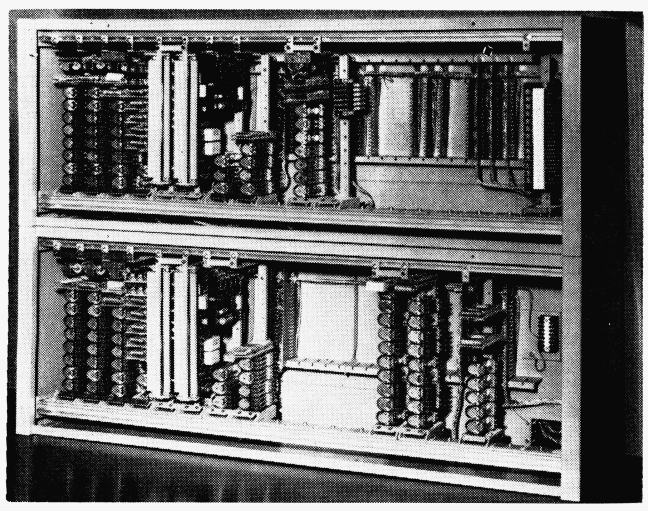


electronic equipment despite power failure. In its final form the system will consist of three identical 40-kVA units, connected in wye at the output for three-phase, four-wire operation and having a total capacity of 120 kVA. Use card or write *Cyberex, Incorporated, 4399 Industrial Parkway, Willoughby, Ohio 44094.*

For more info circle 141 on Reader Service Card

Keytone Tone-to-Dial Pulse Converter System

The KT 100 keytone tone-to-dial pulse converter system provides tone push-button dialing on PABX systems when the existing central office is pulse-driven. The converter translates tone signals from push-button extensions into dial pulses acceptable to the installed switching equipment.



This includes local calling, single-digit trunk accessing, and special code calling, such as attendant line. Up to 200-line PABXs and comparable CO's can be served by a single KT 100 system. Use card or write *North American Philips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

For more info circle 142 on Reader Service Card

Wet-Surface Roof-Repair Kit

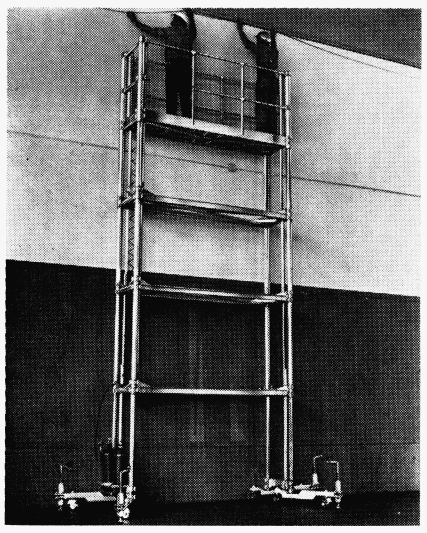
A wet-surface roof-repair kit contains two types of shield-tite roof patch, reinforcing glass membrane, and a roofing brush. Assembled in each kit is everything necessary to patch leaking roofs, such as in the area of antenna installations. Both types of shield-tite roof patch—the brush-on type and the cement suitable for trowelling—can

not only be applied while the roof is wet, but they can actually be used during snowstorms or rain. Use card or write *Randustrial Corporation, 13311-NR Union Avenue, Cleveland, Ohio 44120.*

For more info circle 143 on Reader Service Card

Aluminum Automatic Telescoping Work Platform

The AIR-DECK aluminum automatic telescoping work platform takes two men and their tools up to the exact height required in just seconds. Three models are available for reaching heights up to 27 feet. Utilizing all-aluminum construction, four telescoping support columns are structurally joined using dynamically X-braced

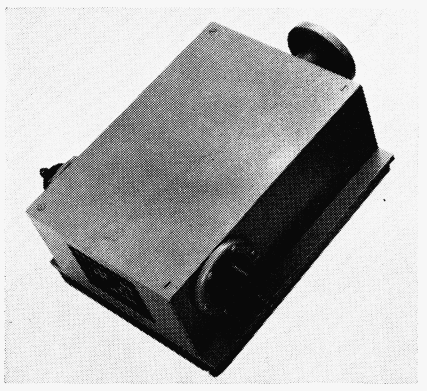


horizontal frames to create the large area work platform. AIR-DECK is powered by self-contained tanks of carbon dioxide (CO_2) for complete mobility and fully automatic operation without the need for electrical power. Use card or write *Up-Right Scaffolds, 1013 Pardee Street, Berkeley, California 94710.*

For more info circle 144 on Reader Service Card

50-600-Ohm Impedance Transformer

The Model BA5-60-10 is a 50-to-600-ohm impedance transformer (balun), weighing only 19 pounds. The unit is dry, convection cooled, for 10,000-W average power operation. Requiring no oil, the unit is free from problems due to oil leakage. Specifications in-

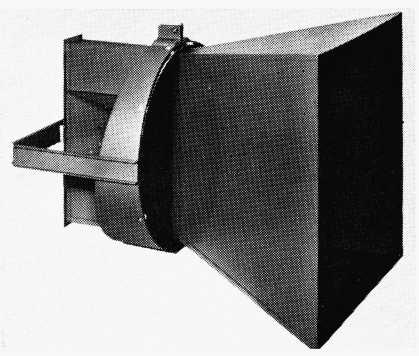


clude 40 kW peak power, VSWR input of 1.2:1, and an impedance ratio of 50 ohms unbalanced to 600 ohms balanced. Frequency range is 20-30 MHz. Use card or write *Electro Impulse, Incorporated, 116 Chestnut Street, Red Bank, New Jersey 07701.*

For more info circle 145 on Reader Service Card

Horn Antenna Covers 375 MHz to 1 GHz

A horn antenna covers 375 MHz to 1 GHz with constant antenna factor and high gain. Due to the constant anten-

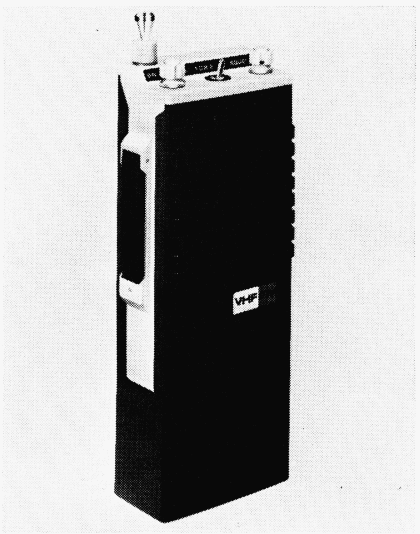


na factor of 5.5, the antenna is ideal for surveillance and for recording spectrum signature as in MIL-STD-449A. Multiplying the antenna output in microvolts developed across a 50-ohm load by the factor of 5.5 gives the RF field intensity directly in microvolts/meter. Use card or write *Singer Instrumentation, 3211 South La Cienega Boulevard, Los Angeles, California 90016.*

For more info circle 146 on Reader Service Card

VHF FM Hand-Held Modular Transceiver

A VHF-FM hand-held modular portable transceiver, designated the Tek 10-2, incorporates automatic signal lock which senses frequency error up to ±5 kHz and automatically compensates the receiver to lock onto the exact transmitted frequency. The ra-



dio's circuitry is comprised of nine sealed plug-in modular circuits. The 21-ounce transceiver is available in both 2-W and 5-W RF versions, operating in the range of 132-174 MHz. Use card or write *Repco, Incorporated, Post Office Box 7065, Orlando, Florida 32804.*

For more info circle 147 on Reader Service Card

Program-Controlled Electronic PABX

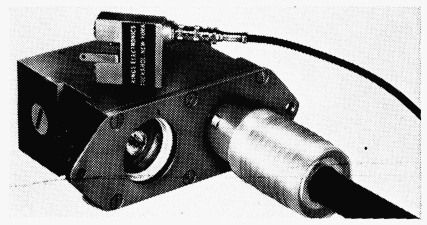
A program-controlled electronic private automatic branch exchange (EPABX), designated the Model PC 512, is operationally compatible with all existing telephone communications equipment. Its solid-state construction incorporates silicon-controlled rectifiers in straightforward, four-stage switching matrices. These matrices and all other circuitry are mounted on plug-in circuit boards to facilitate sys-

tem expansion or reconfiguration. Using a diagnostic program tape and keyboard printer, the cause of any trouble can be isolated to a single printed-circuit board. Maximum capacity is 512 lines. Use card or write *Aerospace and Defense Systems Operation, Philco-Ford Corporation, 3900 Welsh Road, Willow Grove, Pennsylvania 19090.*

For more info circle 148 on Reader Service Card

Coaxial Switching Jacks for RF Transmission

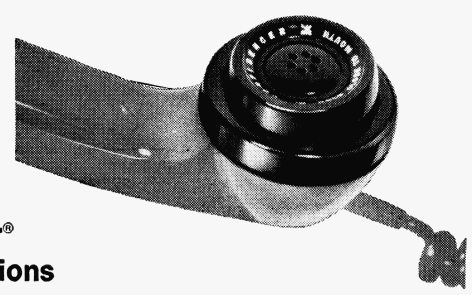
A product of coaxial switching jacks ranges from 10 W to 500 W power handling into 50-ohm impedance. The jacks are designed for quality communications transmission, and provide excellent RF characteristics through 1 GHz. They are available with "K-Loc" positive-lock, quick-release connectors



on the output. Inputs can be "K-Loc", or types "N", "BNC", or "TNC". These switching jacks provide auxiliary contacts which can be timed to operate automatically before or after the RF circuit is completed. Use card or write *Kings Electronics Company, 40 Marbledale Road, Tuckahoe, New York 10707.*

For more info circle 149 on Reader Service Card

The Noise Killer



Roanwell's Confidencer® makes phone conversations as clear as talking face to face

Confidencers eliminate the annoying and costly background noise often found in factories and offices, ruining your telephone communications.

The Confidencer replaces your phone's present microphone and is the same size. It's approved and installed by your phone company. If you have your own internal telephone or paging systems, contact Roanwell direct.

Don't waste another call! Write today for a free demonstration record that lets you hear the amazing improvements a Confidencer will make in your telephone communications. Write: Roanwell Corporation, 180 Varick St., New York 10014. Or Call: (212) 989-1090.

ROANWELL CORPORATION
180 Varick Street, New York, N.Y. 10014

Circle 88 on Reader Service Card

New Items...

Continued from previous page

Miniaturized Adjustable-Loss Pad Mounts on Main Frame or Connector Rack

The K-Pad miniaturized adjustable-loss pad is a direct electrical and impedance replacement for the larger 89 type resistor package. The base or socket for the unit is a double-sided 0.156-center circuit-board connector. Such connectors are available in a variety of configurations all designed to mount on the main frame or connector rack for maximum space saving. The K-Pads come in dB ranges

from 0 to 23 in. 0.2-dB steps and on up to 35 dB with usual attenuation spreads. The unit occupies about ½-inch cube and the resistance network is mounted on a fiber-glass circuit board which is then encapsulated in resin and clearly identified. Use card or write *Kentrox Industries, 14335 Northwest Science Park Drive, Portland, Oregon 97229.*

For more info circle 150 on Reader Service Card

Service Monitor Measures Frequency, FM Deviation, Percentage AM Modulation

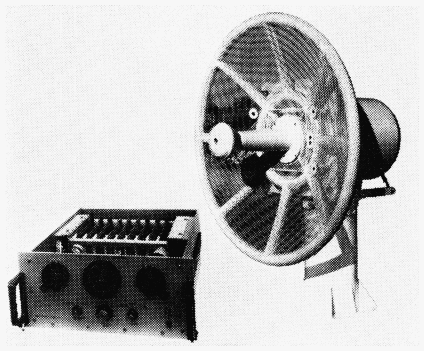
The Model FM-10C communications service monitor measures the frequency, FM deviation, and percentage AM modulation of distant transmitters. This additional capability at great distance is due to the introduction of the high sensitivity RFM-10A plug-in. The FRM-10A has sensitiv-

ity variable from 20 uV to 20 mV, and requires no external preselection. The FM-10C performs the functions of frequency meter, signal generator, and modulation meter for all FM, AM, and SSB work. Use card or write *Singer Instrumentation, 3211 South LaCienega Boulevard, Los Angeles, California 90016.*

For more info circle 151 on Reader Service Card

Boresight Antenna System Simulates Target Dynamics

The Model 4901 boresight antenna system permits simulation of all target dynamics except motion. The antenna, which is available for any 10-percent-wide frequency bandwidth, is currently being produced in S and in C-band. The mast-mounted assembly, which is adjustable both in azimuth and in elevation, features remote control of the

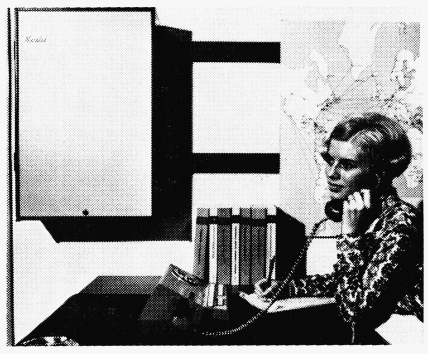


radiated polarization and rotation of the radiated polarization at an adjustable rate; all polarizations between linear and circular are remotely adjustable and rotatable. Frequency range is 2200-2300 MHz (S band) and 5400-5900 MHz (C band). Use card or write *Datron Systems, 20716 Plummer Street, Chatsworth, California 91311.*

For more info circle 152 on Reader Service Card

Small-Capacity Indirect Electronic Branch Exchange

The electronic branch exchange EBX-15 is a compact, small-capacity, indirect type PABX featuring sealed mini-reed relays and reliable solid-state circuitry. The unit is housed in a cabinet measuring 30 inches high by 20 inches wide by 9 inches deep, suitable for floor or wall mounting, that contains all necessary registers, matrices, connecting circuits, relay sets, and the

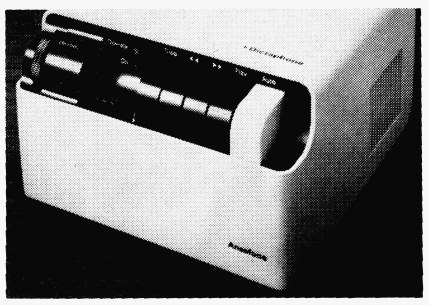


common control circuit. The EBX-15 provides two-digit internal dialing with up to three links, offers "dial 9" access for up to three trunks, and can be operated with or without an attendant console to handle up to 15 lines. Use card or write *North American Phillips Corporation, 91 McKee Drive, Mahwah, New Jersey 07430.*

For more info circle 153 on Reader Service Card

Electronic Telephone Answering System

A new electronic telephone answering system can be programmed in advance to set the time allowed for incoming messages. The Ansafone 640 can be preset to limit incoming callers to 30 seconds of recording or to permit a continuous message of up to 30 minutes. When the unit is in the continuous mode, an automatic voice-op-

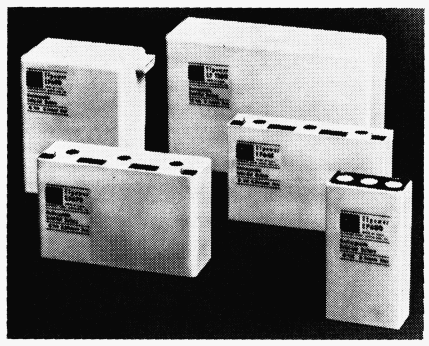


erated relay enables the caller to pause for up to 12 seconds without losing the line. With the 640, the outgoing message cartridge, with a capacity for an announcement of from 15 seconds to 3 minutes, is plugged inside the unit. Use card or write *Dictaphone Corporation, 120 Old Post Road, Rye, New York 10580.*

For more info circle 154 on Reader Service Card

Leakproof Solid-Gel Rechargeable Batteries

Leakproof rechargeable batteries offer the Elpower solid-gel electrolytic agent which efficiently replaces non-rechargeable dry-cell batteries. The batteries can be connected in series or

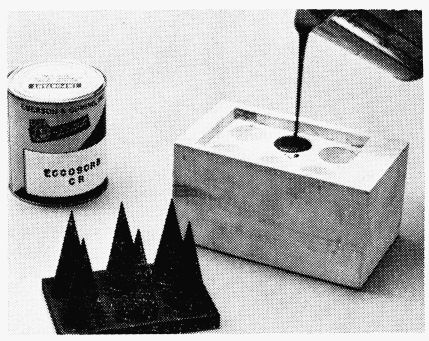


parallel, function in any position in temperatures ranging from extreme heat to extreme cold, and can be recharged hundreds of times. The line of batteries is available in either 6 or 12 V in sizes that deliver from 3 to 8 ampere hours. Use card or write *Elpower Corporation, Division of Eldon Industries, 2117 South Anne Street, Santa Ana, California 92704.*

For more info circle 155 on Reader Service Card

Microwave Component Absorbing Materials

Eccosorb CR and Eccosorb CR-S are two component castable absorbing materials which can be used by microwave engineers to cast transmission-line components into place or to cast intricate shapes which might be difficult to machine from sheet or rod

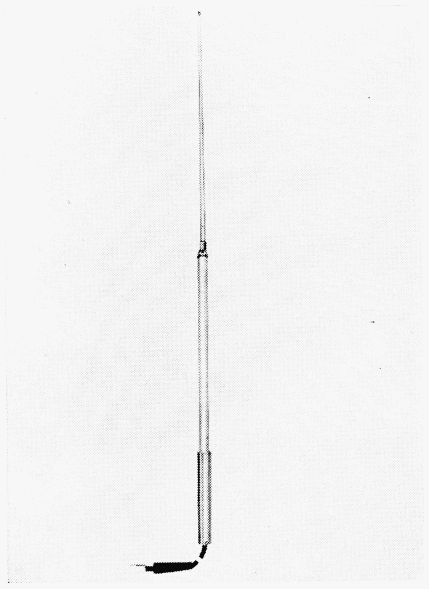


stock. Eccosorb CR is based on epoxy resin, while Eccosorb CR-S is based on silicone rubber. Both have magnetic as well as dielectric loss. The CR Series can be used at temperatures to 180°C. The CR-S Series is flexible and can be used at temperatures to 260°C. Use card or write *Emerson & Cuming, Incorporated, Canton, Massachusetts 01801.*

For more info circle 156 on Reader Service Card

Lightweight 30-50-MHz Base-Station Antenna

A lightweight base-station antenna, the Model ASP-770, is designed for operation at 30-50 MHz. Weighing 10 pounds, the antenna is constructed of Armorweave fiber glass, providing maximum weather protection without discoloration. It is measured at unity



gain in accordance with EIA Standard RS-329, and will accommodate in excess of 500 W RF power. The Base Commander is wind-rated at 129 miles per hour. Use card or write *The Antenna Specialists Company, 12435 Euclid Avenue, Cleveland, Ohio 44106.*

For more info circle 157 on Reader Service Card

Compact Waveform Monitor with 5-Inch Picture CRT

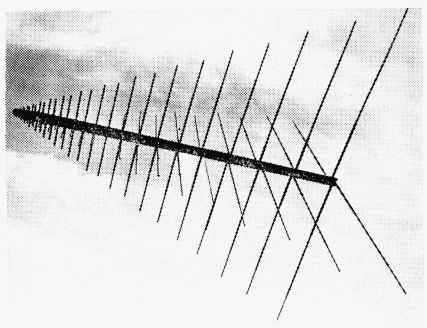
A compact version of the company's waveform monitor is offered in conjunction with a high-resolution 5-inch picture monitor. The assembly requires only 7 inches of rack space and is designed primarily for placement of one such array on the output of each

camera in a studio system, although it may be connected anywhere in the video circuit. A tally light to show camera status is included. Use card or write *Ultra Audio Products, Post Office Box 921, Beverly Hills, California 90213.*

For more info circle 158 on Reader Service Card

Crossed Planar Log-Periodic Dipole Antenna

The Model APX1453 crossed planar log-periodic dipole antenna is capable of receiving dual linearly polarized waves. By utilizing additional components, other polarizations, including oblique and circular (either hand), can be received and if desired described in an X-Y coordinate system.

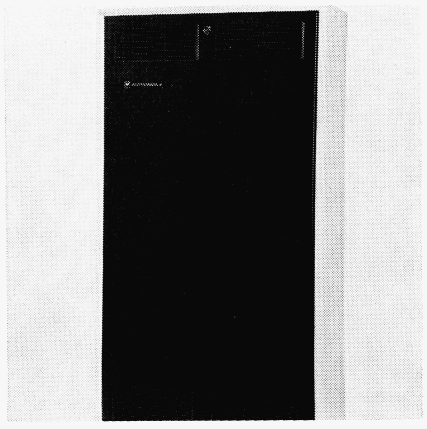


A quadrature hybrid method of obtaining circular polarization is also available for use with this antenna. Frequency range is 30-1000 MHz, with a front-to-back ratio of 15 dB. Use card or write *American Electronic Laboratories, Post Office Box 552, Lansdale, Pennsylvania 19446.*

For more info circle 159 on Reader Service Card

VHF and UHF FM Base Stations

MICOR base stations are available in upright cabinet installations, or they can be obtained in 30 or 40-inch compact cabinets. The transmitter insures less interference between users in crowded radio environments. A "sensitron" receiver enables the dispatcher



to receive even the weakest signals in high-density areas. A power control circuit is built into all base stations. This device insures full performance even if the antenna shorts or disconnects. Use card or write *Motorola Communications and Electronics, 1301 East Algonquin Road, Schaumburg, Illinois 60172.*

For more info circle 160 on Reader Service Card

Protect Your Electronic Equipment the Reliable Way

Designed expressly to house communications and microwave electronic equipment, Fort Worth **Mobilt Communications Buildings** withstand any climate or location problem...house electronic equipment according to the most rigid standards. **Mobilts** are available in popular sizes or custom-built... yet, surprisingly inexpensive.

• Installed in Minutes

Your **Mobilt** building can be ready to work for you in minutes. You have no rig-up delays on arrival because your building comes with supporting I-beams. Simply drop on your site, connect the service inlet, and you're in business.

• Reduced Cost and Waiting Time

Mobilts save you time and money because complete wiring is installed at the factory. Unlike conventional building, equipment can be delivered with it, at your option, rather than installed on location.

• Quality Construction

Mobilts are designed expressly to house electronic equipment. Result? Problems like inadequate tightness, poor ventilation and improper sealing of doors are nonexistent.

And...an absolute minimum of maintenance is required.

Many options are available in size, outside finish, wiring and ventilation. You owe it to yourself to write for full specifications on these rugged, versatile equipment buildings. You'll find one exactly suited to your needs...at an economical price.

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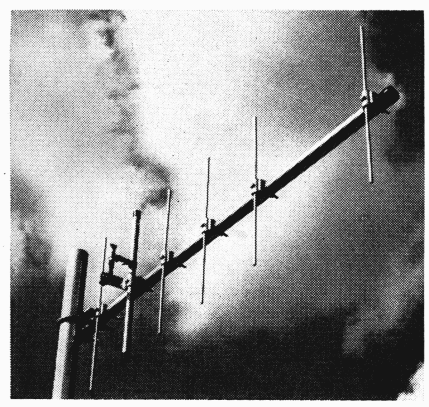
Circle 89 on Reader Service Card

Six-Element Rear-Mount 450-MHz Yagi Antenna

A new six-element rear-mount 450-MHz yagi is designed for amateur FM repeater operation. The unit can be used for control links and stations for monitor applications and access to 450-MHz repeaters. It exhibits 10-dB gain. The antenna has direct 50-ohm

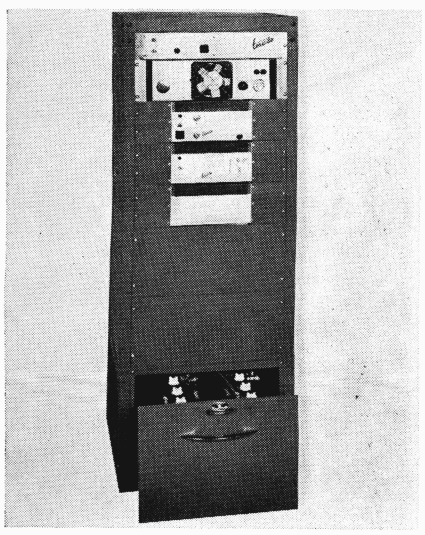


Reddi Match feed with built-in coax fitting. The boom is 35 inches long and the overall weight is 3 pounds. Use card or write *Cush Craft, 621 Hayward Street, Manchester, New Hampshire 03103.*

For more info circle 161 on Reader Service Card

Standby 3000-W Power Source

The Series Six-60 standby power system includes a battery power source of 117-VAC, 60-Hz power, an analog computer charging system, DC-to-AC output inversion system, and automatic load-transfer circuits. The unit instantaneously provides power up to

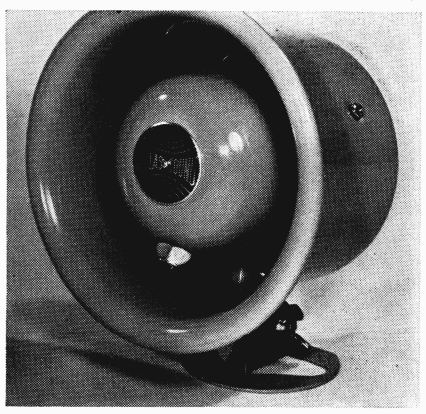


3000 W during power outages or blackouts. The power system includes the choice of battery—lead acid, lead calcium, or nickel cadmium. Use card or write *Terado Corporation, 1068 Raymond Avenue, St. Paul, Minnesota 55108.*

For more info circle 162 on Reader Service Card

All-Weather Reflex Speaker

Ease of impedance selection and mechanical mounting are two of the characteristics offered in the all-weather WR-5T reflex speaker. Through the use of the built-in line transformer with a screw-driver-adjustable watts/impedance switch, proper line connection and sound level adjustment are achieved very

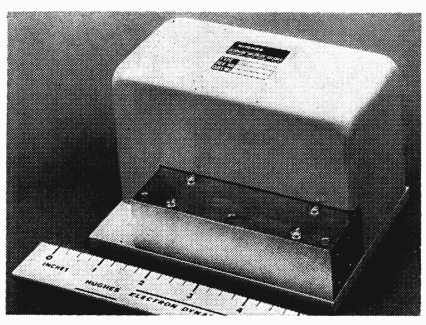


quickly. The 70-V impedance levels are 8000, 4000, 2000, 1000, and 666 ohms. The power levels which may be selected are 7.5, 5, 2.5, 1.25, and 0.65 W at 70 V, and 1, 0.62, and 0.31 W at 25 V. Use card or write Atlas *Sound, 10 Pomeroy Road, Parsippany, New Jersey 07054.*

For more info circle 163 on Reader Service Card

IMPATT Diode Amplifier Operates in Ka-Band

A silicon IMPATT diode amplifier, operating in the Ka-band between 33 and 40 GHz, features small size and long life. The unit, Model 46613H, is designed as an alternative to high-power multipliers or traveling-wave tube amplifiers. It is available in a wide variety of output, gain, bandwidth, and frequency performance specifications. The amplifier consists of two circulator-coupled reflection amplifier stages. By properly tuning

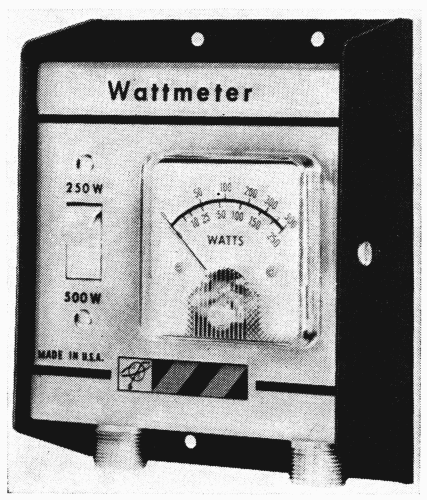


each of the two stages, various specifications can be obtained. As an example, a unit with a bandwidth of 2.5 GHz can have 10-dB gain and 200 mW of output power. Use card or write *Hughes Electron Dynamic Division, 3100 West Lomita Boulevard, Torrance, California 90509.*

For more info circle 164 on Reader Service Card

RF Wattmeter Measures to 500 W

The Model 257 wattmeter measures the actual power output of transmitters to within ±5%. Also featured is a wide power handling capability with two switch selectable ranges of 250 and 500 W at full scale. The only connection needed to use the wattmeter is insertion in the antenna line using

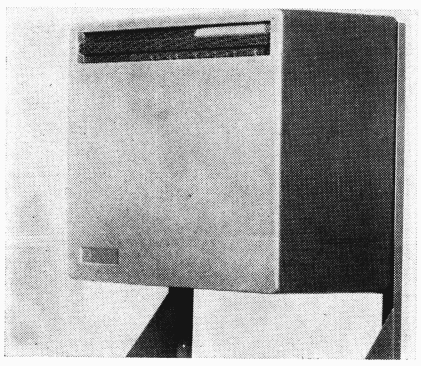


standard coax connectors. The 257 can be mounted on a wall or desk top or can be installed on an accessory station console. Use card or write *Antenna Specialists Company, 12435 Euclid Avenue, Cleveland, Ohio 44106.*

For more info circle 165 on Reader Service Card

Floor Mount for WE Key Service Units

For floor mounting of Western Electric Model No. 513 and No. 515 key service units, a pair of pressed steel legs and spreader bars will accommodate the basic No. 513 unit. Extender bars, coupled to the spreaders, expand the width of handle No. 515 units.



Tapped holes in the legs match back boards of both units, permitting field conversion. Use card or write *General Communications Products, Church Road and Roland Avenue, Mount Laurel, New Jersey 08057.*

For more info circle 166 on Reader Service Card

27-Range Portable Digital Multimeter

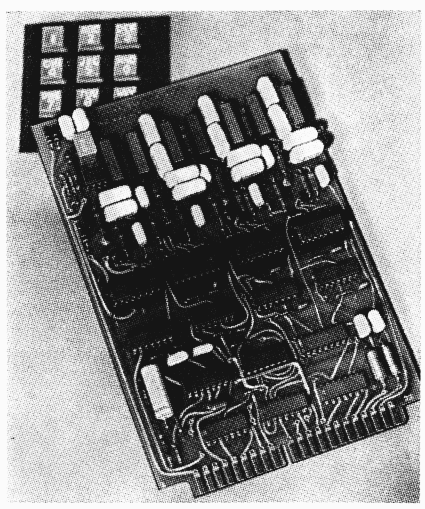
The Model 3300A portable digital multimeter measures 27 ranges of AC/DC voltage, current, and resistance. It will operate 24 consecutive hours off its internal nickel-cadmium battery before requiring a recharge. The 3½-digit display is nonblinking.

The automatic zeroing circuit adjusts for zero before every reading. Decimal point is automatically positioned, and polarity is automatically displayed. Use card or write *The Hickok Electrical Instrument Company, 10514 Dupont Avenue, Cleveland, Ohio 44108.*

For more info circle 167 on Reader Service Card

Touch-Tone Receiver Converts to TTL-Compatible Signals

The TD-113 touch-tone receiver converts standard two-tone signals into one of 12 TTL-compatible signals. It provides a TTL logic zero and strobe for a valid input signal. The receiver will accept all valid touch-tone signals

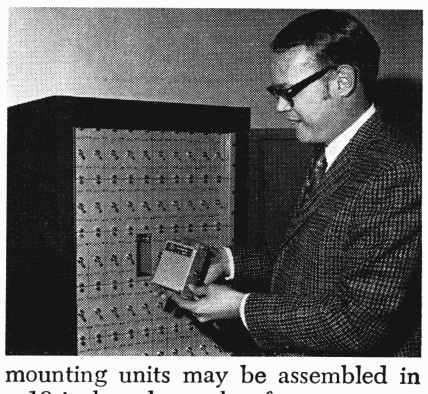


over the commercial telephone range or may be used with a touch pad directly, in private systems. Applications include data terminals, security systems, private key systems, mobile communications systems, and credit-checking systems. Use card or write *Teletron Company, 40 Elliott Street, Melrose, Massachusetts 02176.*

For more info circle 168 on Reader Service Card

Manual Switch for Line Monitoring and Fall-Back

The Model 5700 manual-operated switch, designed for line monitoring and fall-back operations, is based on DATA-RITE edge-to-dome contacts. The switches use 24-pole DT toggle switches and are packaged as individual components for panel, bench, or shelf mounting. Up to 10 panel-

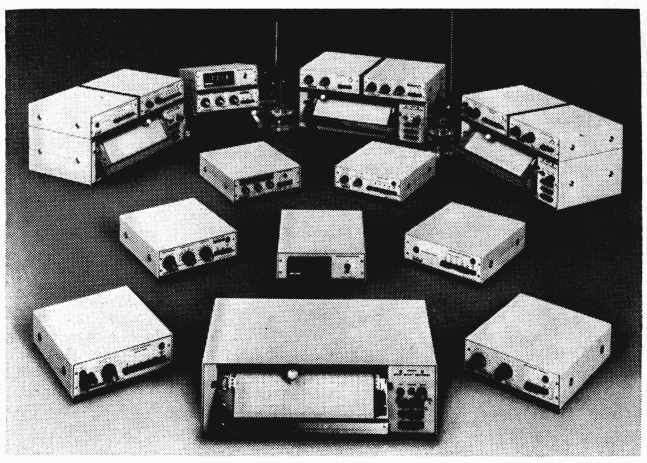


mounting units may be assembled in a 19-inch rack panel to form compact, efficient control consoles. Three EIA RS-232 receptacles accept input and output signals. Accessories available include cables, connectors, receptacles, and rack-mounting panels. Use card or write *T-Bar Incorporated, Wilton, Connecticut 06897.*

For more info circle 169 on Reader Service Card

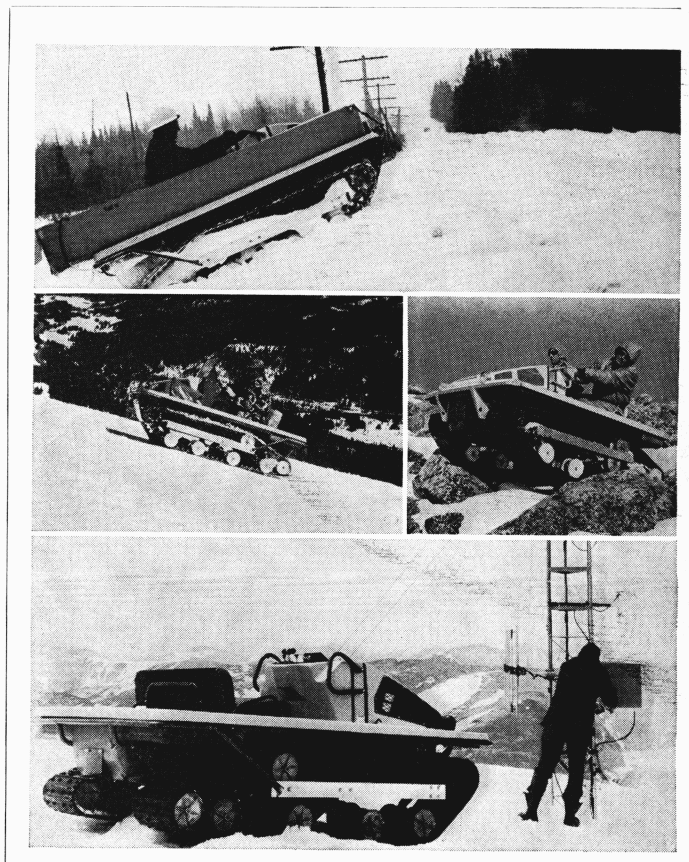
Modules Form Measuring, Monitoring, Recording, and Controlling Systems

A series of modules, called the "200-System", consists of individual instruments that can be physically and electrically interconnected to form various precision measuring, monitoring, recording, and controlling systems. Modules available include a 23-speed 10-inch strip-chart recorder, a DC offset module that provides up to 15.1 full scales of calibrated suppress, an input amplifier module that produces a 1-V output for any input between 1mV and 500 V,



a pH/pIon module, a digitizer/indicator module with BCD TTL output, a temperature module, a limit detector module, and a four-channel multiplexer module. Use card or write *Heath/Schlumberger Scientific Instruments, Benton Harbor, Michigan 49022.*

For more info circle 170 on Reader Service Card



The TRACKSTER.® Makes mole hills out of mountains.

When your crews have to get to mountain top microwave towers, travel along overgrown rights-of-way or make emergency repairs in the deep snow or mud that accompanies storms, send in the TRACKSTER. It's a new go-almost-anywhere vehicle that travels on tracks instead of wheels. Tracks that'll carry four men, or two men and their gear to places no ordinary vehicle could ever reach.

Haul a TRACKSTER as far as the roads go. Then put almost anything aboard—cross arms, replacement parts, test equipment—and take off over mud, sand, rocks, and up 45° grades.

The TRACKSTER. Takes you where you need to go... and back again.

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Title_____ Organization_____

Address_____

City_____ State_____ Zip_____

73-T-3

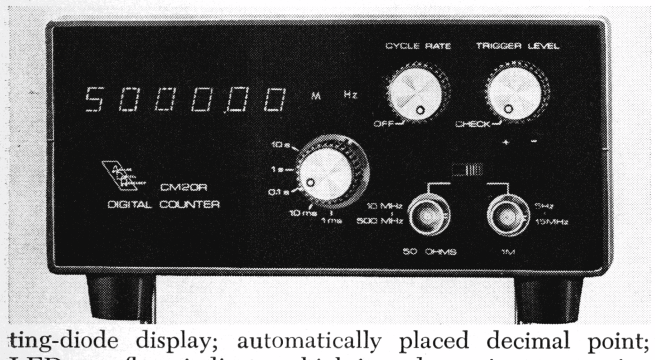
Circle 90 on Reader Service Card

New Items . . .

Continued from previous page

Portable Digital Frequency Counter

The CM20R portable digital frequency counter is designed for use in the mobile radio and telecommunications fields. The five-digit single-plane display (sixth digit optional) incorporates large, bright characters which provide good readability under high ambient light conditions at distances of up to 12 feet. Other features include light-emit-

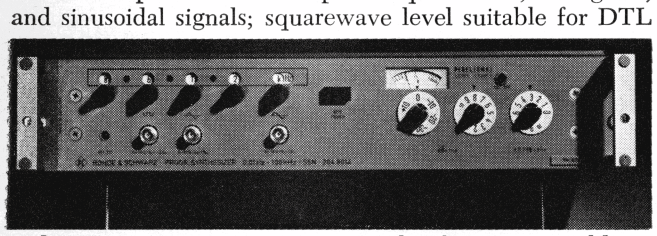


ting-diode display; automatically placed decimal point; LED overflow indicator; high-impedance input covering 5 Hz to 15 MHz; and a 50-ohm input covering 10 MHz to 500 MHz. A slide switch selects which input will be used, and automatically repositions the decimal point. Use card or write *Analog Digital Research, 1051 Clinton Street, Buffalo, New York 14206.*

For more info circle 171 on Reader Service Card

Programmable Synthesizer Offers Crystal-Controlled Frequencies

The Type SSN programmable synthesizer offers crystal-controlled frequencies—squarewave, triangular, and sinusoidal at 0.01 Hz to 120 kHz, squarewave up to 1.2 MHz. Other features include three separate paralleled outputs with fixed phase relationship for squarewave, triangular, and sinusoidal signals; squarewave level suitable for DTL

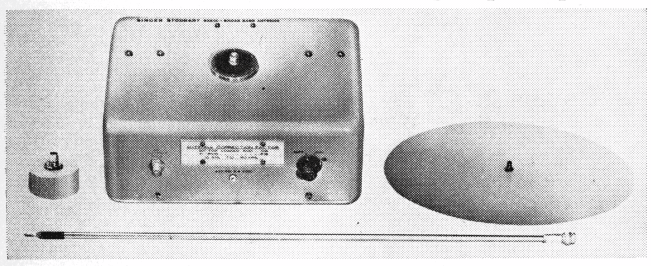


and TTL circuits; sinewave output level, programmable in dB; and electronic frequency programming (BCD negative code) with short response time—less than 100 μs (10 ms after switchover) with no overshoot. Use card or write *Rohde & Schwarz Sales Company, 111 Lexington Avenue, Passaic, New Jersey 07055.*

For more info circle 172 on Reader Service Card

Broadband Rod Antenna for Measuring Low-Level Fields from 10 kHz to 40 MHz

A broadband rod antenna offers a 26-dB sensitivity increase for measuring low-level electric fields in the range of 10 kHz to 40 MHz. It also exhibits constant antenna factor over this entire frequency range making the antenna ideal for automatic or swept-frequency measurements. The rod antenna includes a broadband, high-input-impedance

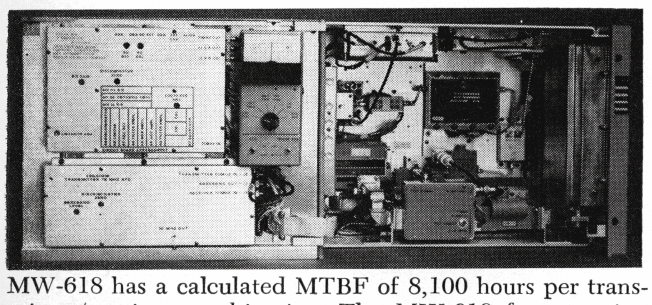


preamplifier, an adjustable rod antenna, a top-loading disk, and a 50-ohm input adapter. The top-loaded, 1-meter-effective-height antenna is only 50 inches; this low height permits its use in a shielded room. Use card or write *Singer Instrumentation, 3211 South LaCienega Boulevard, Los Angeles, California 90016.*

For more info circle 173 on Reader Service Card

Microwave Equipment for Common-Carrier Applications

The Type MW-618 microwave equipment is designed for high-quality common carrier applications in the 10.7 to 11.7 GHz frequency band. The solid-state equipment provides a high-performance system capability of 1,200 voice channels or NTSC color video with four subcarriers. The

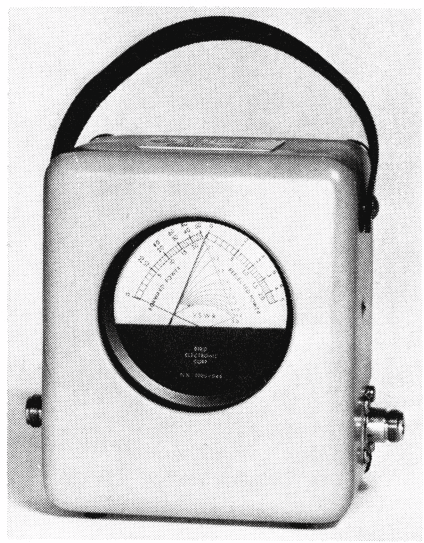


MW-618 has a calculated MTBF of 8,100 hours per transmitter/receiver combination. The MW-618 features simplified maintenance and testing procedures and has built-in meters with switchable functions for routine tests. Use card or write *Collins Radio Company, 1200 North Alma Road, Dallas, Texas 75207.*

For more info circle 174 on Reader Service Card

Dual Wattmeter-VSWR Monitor

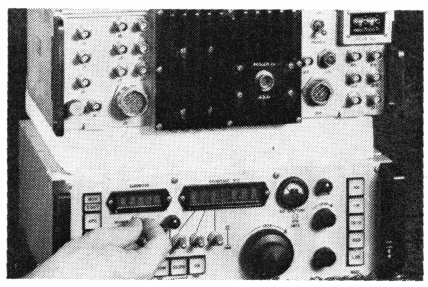
The Model 4342 dual wattmeter-VSWR monitor displays the three prime RF transmission measurements at once on a single meter face: forward and reflected power are indicated by individual pointers and VSWR is monitored on a third scale from the intersection of the two power pointers. The entire set of three transmission parameters is read out simulta-



neously during normal RF operations or during maintenance adjustment procedures. Full-scale power levels at ±5% accuracy range from 10 to 5000 W for reflected, in frequency bands from 2 to 2300 MHz. Use card or write *Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon), Ohio 44139.*

For more info circle 175 on Reader Service Card

Remote-Controlled HF Receiver System



A remote-controlled HF receiver system has been developed for the United States Army. As shown in the photograph, the system consists of a remote-control unit (bottom) and a receiver. Operating over extreme environmental conditions, the equipment can be utilized in airborne, mobile, and ground installations. Use card or write *Avco Electronics Division, 2630 Glendale-Milford Road, Cincinnati, Ohio 45241.*

For more info circle 176 on Reader Service Card

Galvanizing Compound Rust-Proofs Antennas

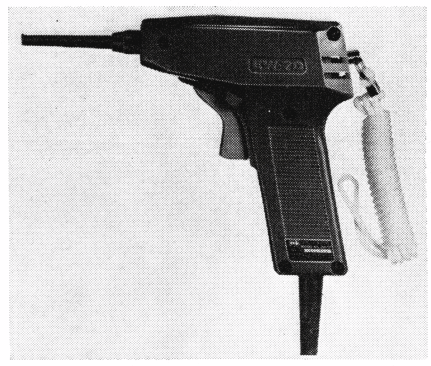
The Instant Cold Galvanize compound, available in a ready-to-use aerosol spray, contains 95% zinc and has withstood over 3000 hours in salt spray tests. It also rust-proofs metals for three years or more. Electrochemi-

cal action fuses the zinc to the metal, and if the coating is penetrated the galvanize will sacrifice itself to protect the exposed base metal. Use card or write *Ameco, Incorporated, Post Office Box 13741, Phoenix, Arizona 85002.*

For more info circle 177 on Reader Service Card

Pistol-Grip Wire-Wrapping Tool

The Model EW-7D pistol-grip, wire-wrapping tool, with its reinforced fiber-glass housing, gives the operator a lightweight, easy-to-use tool, only 12.7 ounces (360 grams). It will produce a solderless wire-wrapped connection of "gas-tight" quality. This tool will accommodate wire in sizes

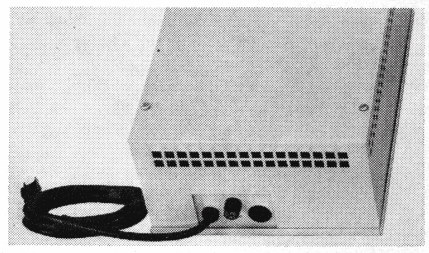


from AWG 22 (0.65 mm) through AWG 32 (0.20 mm). The EW-7D is equipped with a 9-foot-long grounded 3-wire cord and plug. A nylon neck harness is mounted on the tool. Use card or write *OK Machine and Tool Corporation, 3455 Conner Street, Bronx, New York 10475.*

For more info circle 178 on Reader Service Card

Power Supply Furnishes Filtered 48 VDC

A compact power-supply unit is designed to supply 48-VDC filtered talking power and AC signaling outputs along with five-frequency ringing power for private communications systems. The Model RT5M unit operates from 120-V, 60-Hz single-phase input and has taps to adapt its usage to high or low line conditions. Input

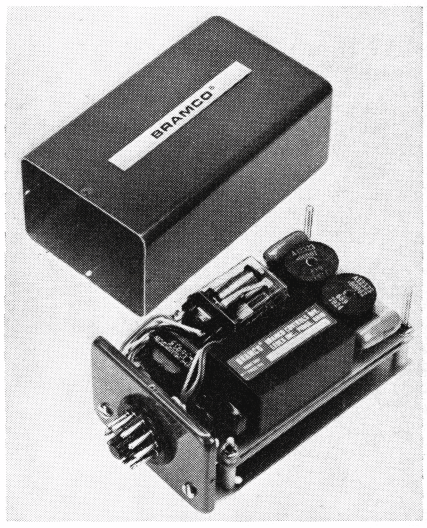


current is 1.4 A at full load. The ringing output provides 110 V, 5W, at each of five selected ringing frequencies (one frequency generated at a time). Output frequencies from 16 to 66⅔ Hz may be adjusted. Use card or write *Lorain Products Corporation, 1122 F Street, Lorain, Ohio 44052.*

For more info circle 179 on Reader Service Card

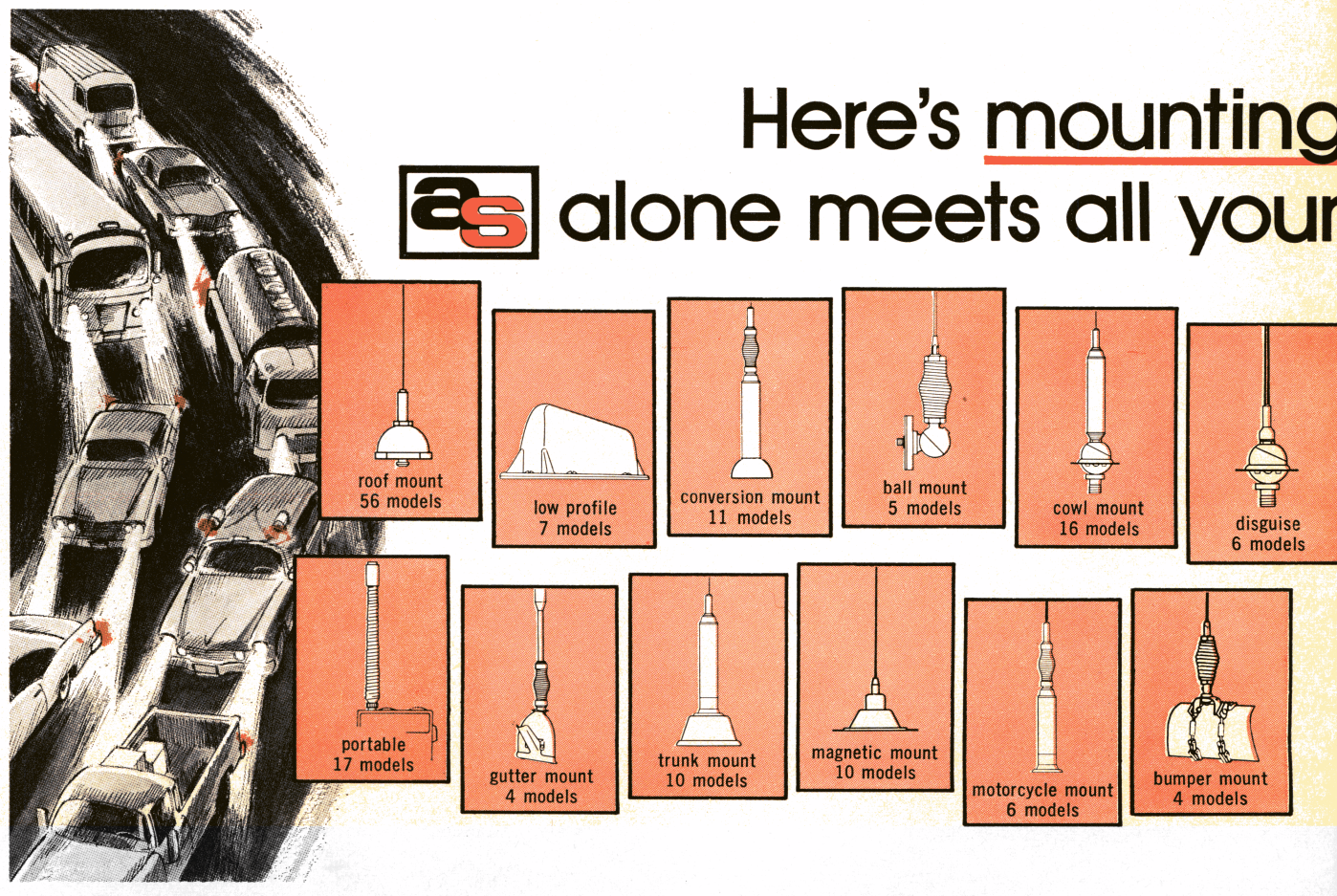
Multifrequency Tone Receiver

The Model MD426 multifrequency tone receiver responds to the commonly used 2-of-6 signaling code. Each receiver is programmed to respond to one pair of tones in the 700, 900, 1100, 1300, 1500, and 1700-Hz system. Differential tone-detector circuits protect against falsing. For maxi-



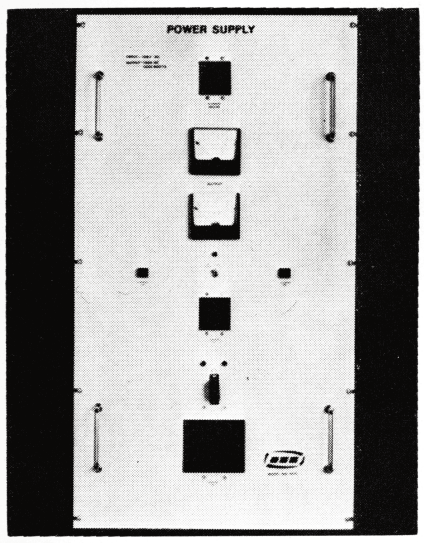
mum security, a time-delay circuit can be provided which requires the code tones to be present for a specified time before the monitor will respond. Use card or write *Bramco Controls, Division of Ledex, College and South Streets, Piqua, Ohio 45356.*

For more info circle 180 on Reader Service Card



Power-Supply Unit with Standby

A new power-supply unit with standby is offered for headend or microwave applications. The Model 1600 power-supply unit provides for continuous operation without delay or transfer time. It is synchronized to commercial 60 Hz. Stability of the inverter is 0.03 Hz. The unit is arranged for 19-inch rack mounting and for 120-V, 60-Hz sine wave. Input is 108 VDC from automotive or stationary batteries. Use card or write *Interstate Telephone and Electronics, Post Office Box 34497, Dallas, Texas 75234.*



For more info circle 181 on Reader Service Card

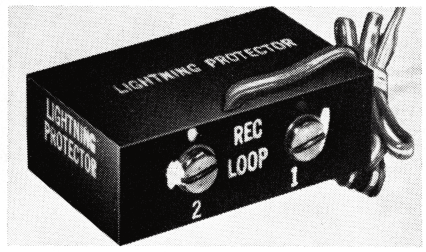
Mobile FM Monitor Receiver

The Model MR-472 mobile FM monitor receiver operates in either one of the commonly used two-way band between 30 and 500 MHz, and is fully compatible with existing narrow-band FM communications equipment. Switch-selected five-channel operation is made possible with Option A (five-position channel switch, knob, and five-crystal board), while Option C (110-VAC adapter) converts the mobile receiver to 110-VAC line operation. Operating band is low, high, or UHF, NBFM. Use card or write *Communication Coil Company, 2839 North Narragansett Avenue, Chicago, Illinois 60634.*

For more info circle 182 on Reader Service Card

Low-Voltage Protector Guards Solid-State Units

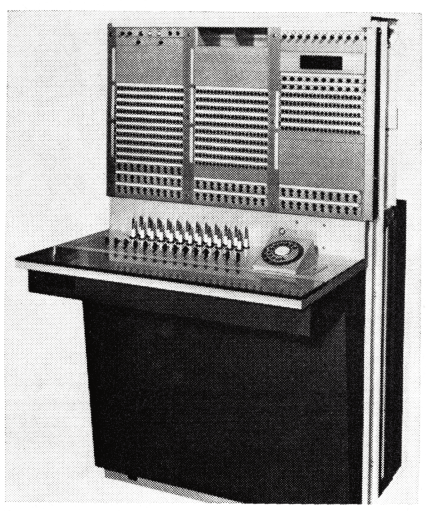
A low-voltage protector guards transistorized communications, process control, and computer equipment from surge. Maintaining balance between two wires, the protector restricts the voltage difference to a predetermined value and simultaneously prevents either line voltage from exceeding a given line-to-ground specification. Eight standard models are available with from 8 to 500 V (maximum) line-to-line voltage. All units can withstand 20-kA surge current as defined by 8/20 waveform. Use card or write *Telecommunications Industries, 1375 Akron Street, Copiague, New York 11726.*



For more info circle 183 on Reader Service Card

Cord-Type 800-Line Telephone System

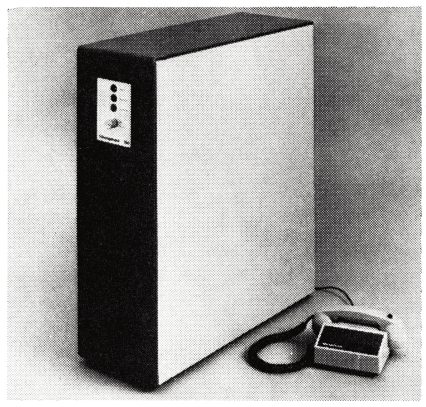
A new telephone system, the FXB-506U, is a cord-type system with a maximum capacity of 800 lines designed to meet the requirements of the hotel/motel market. "Camp-on Busy" allows the attendant to notify a station user during a phone conversation of a waiting call by an audible beep. Other features include room readout, trunk-to-trunk connections, direct outward dialing, attendant call transfer, predetermined night answer, and station-to-station calling. Use card or write *United Business Communications, 6405 Metcalf Avenue, Shawnee Mission, Kansas 66202.*



For more info circle 184 on Reader Service Card

Word-Processing Unit Uses Endless Magnetic-Tape Loop

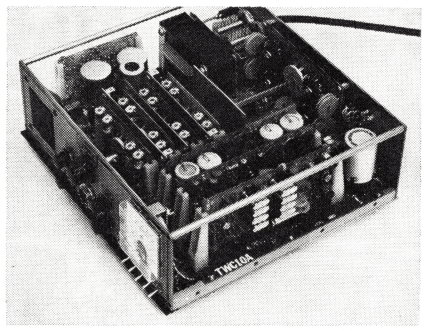
The Series 180 unit for word-processing systems uses an endless loop of magnetic tape, sealed in a "Thought Processing" tank, to instantly take down and transmit dictation. It is conveyed by an office telephone, either inside the office or externally. If a Touch-Tone system is used from outside the office, the user has control of the following dictation functions—start, stop, replay, edit, and correct. The storage and transmission of recorded material is fully automatic. Use card or write *Dictaphone Corporation, 120 Old Post Road, Rye, New York 10580.*



For more info circle 185 on Reader Service Card

HF SSB Transceivers and Accessories

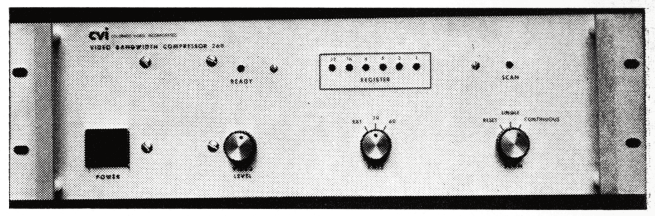
A range of HF SSB transceivers and accessories includes the Model TWC5A single-channel 60-W-PEP transceiver and the TWC10A four-channel, 120-W-PEP transceiver. The equipment makes extensive use of integrated circuits and all complex circuitry is contained on printed circuit boards. The TWC10A is fitted with VOX, squelch, and CW as standard features, plus models for 12 VDC and 115/230 VAC. With 8 the correct choice of antennas, the TWC10A transceiver can be used for ranges of 1500 kilometers or more. Use card or write *Trans World Communications, Post Office Box 2253, Escondido, California 92025.*



For more info circle 186 on Reader Service Card

Video Compressor Compresses Bandwidth of TV Signals to Audio Range

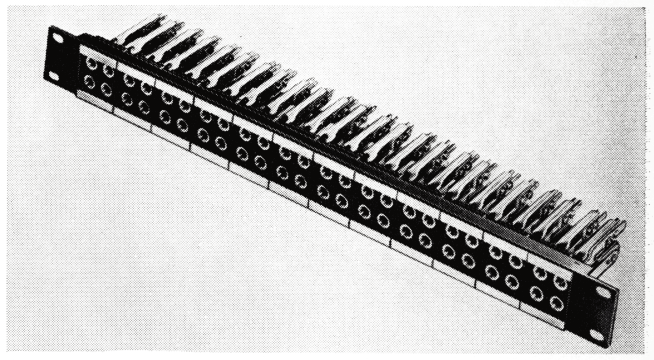
The Model 260 video compressor is a device which accepts standard television signals and compresses the bandwidth to the audio range for transmission over ordinary "dial-up" phone lines. The 260 also incorporates a 6-bit analog-to-digital converter. The unit may be used as a TV-to-computer interface for image analysis or industrial control. Use card or write *Colorado Video, Incorporated, Post Office Box 928, Boulder, Colorado 80302.*



For more info circle 187 on Reader Service Card

Extruded Aluminum Jack Panels Accept 56 Telephone Jacks Mounted to 14 Inserts

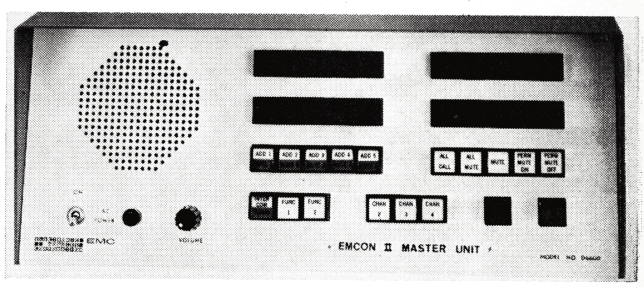
Extruded aluminum jack panels accept up to 56 telephone jacks mounted to 14 module inserts. Module inserts or jacks can be removed without disrupting lines to other jacks. The Series "JP" jack panels are designed primarily for voice-frequency interconnecting applications including telephone central offices, testing and patch panels, computer and data processing equipment, and other uses. Three panel mounting styles are available—one flush and two extension mount for control panels and standard rack mounts. Panel lengths accommodate standard 19 and 23-inch wide racks. Use card or write *Switchcraft, 5555 North Elston Avenue, Chicago, Illinois 60630.*



For more info circle 188 on Reader Service Card

Remote-Control System Provides Central Control of up to 25 Wayside Transceivers

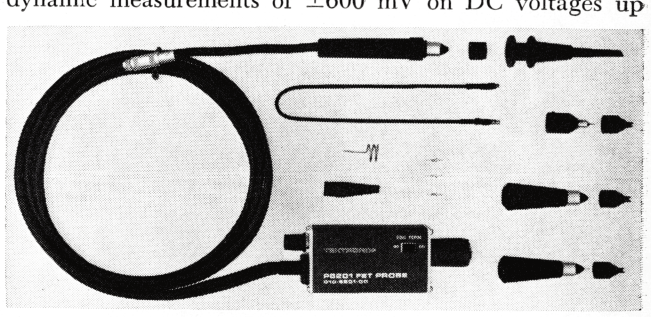
The use of digital computer techniques to provide secure, centralized control of up to 25 wayside transceivers (as used in railroads, pipelines, and similar networks) is the key feature of the EMCON II remote-control system. The system consists of a master station and a number of remote stations which, on command from the master, activate or deactivate the remote transceivers or other equipment to which they are connected. Included in the master and remote stations are complete audio facilities allowing voice communications. The units can be connected by any 600-ohm link capable of handling the 300-3000-Hz audio range. A digitally encoded 2000-Hz tone transfers two-way information between the dispatcher's main station and the remote station(s) addressed. Use card or write *Electronic Modules Corporation, Post Office Box 141, Timonium, Maryland 21093.*



For more info circle 189 on Reader Service Card

DC-to-900-MHz Nonattenuating FET Low-Noise Oscilloscope Probe

A DC-to-900-MHz nonattenuating, low-noise FET oscilloscope probe offers an input capacitance of 3 pF, which minimizes circuit loading. The probe is ideal for both 50-ohm sampling and 1-megohm conventional scopes (input termination is internally switchable). A DC offset permits dynamic measurements of ±600 mV on DC voltages up to ±5.5 V. The probe is designed for the company's 7904—500-MHz, 485—350-MHz, 7704A—250-MHz, and 475—200-MHz scopes. Bandwidth is —3 dB, and rise-time is 0.4 ns or less. Use card or write *Tektronix, Post Office Box 500, Beaverton, Oregon 97005.*



For more info circle 190 on Reader Service Card

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ASP-700 UHF antenna. Similar construction and ratings except has 7.0 dB gain, 10 MHz bandwidth, 250 watt power rating. $119.50 mfgr. suggested resale price.

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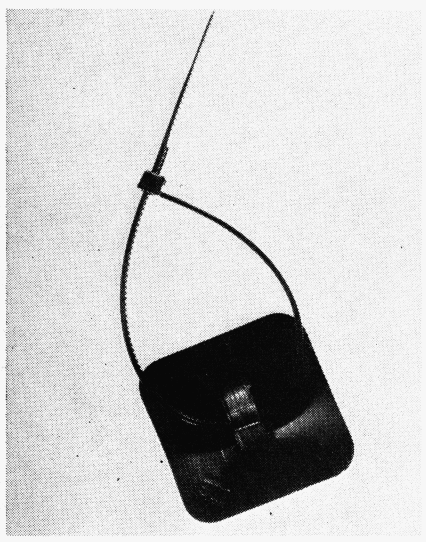
Circle 92 on Reader Service Card

New Items . . .

Continued from previous page

Self-Locking, Releasable, Adhesive-Backed Cable Tie

A self-locking, easily releasable, reusable cable tie with a flexible, adhesive-backed mounting base is available for the communications, electronics, and electrical construction markets. It will fasten to curved ductwork, pipes, radius corners, or other irregular surfaces without drilling. Called the 791 cable tie and flexible base, the product may be used to harness and support multiconductor communications cable up to 1¾ inch di-

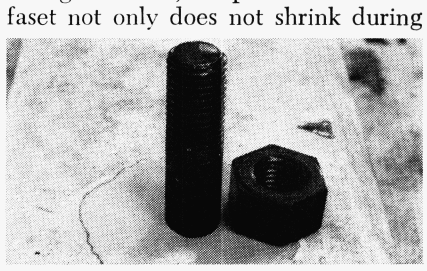


ameter, depending on spacing. Spaced 18 inches apart, the tie assemblies will support a 50-pair 22 AWG cable; closer spacings can hold larger pair-count cable. The 791 cable tie is designed to support a static load of ½ pound at 18-inch spacing and requires 38 pounds of direct pull-off pressure to release the base adhesive. Use card or write *3M Company, Post Office Box 33600, 3M Center, St. Paul, Minnesota 55133.*

For more info circle 191 on Reader Service Card

Bolt-Anchoring Compound Has 110,000-Pound Strength

Bolt Anchor Sulfaset compound is mixed with water, poured around a bolt, and within 30 minutes is able to withstand 46,100 pounds of pull. After an hour, the bolt has a pull-out strength of 110,000 pounds. The Sulfaset not only does not shrink during



the hardening process, but it actually expands, insuring a tight, permanent fit. It forms an ideal base for anchoring antenna towers to a concrete base. Use card or write *Randustrial Corporation, 13311-NR Union Avenue, Cleveland, Ohio 44120.*

For more info circle 192 on Reader Service Card

Multiplex Stereo Signal Generator

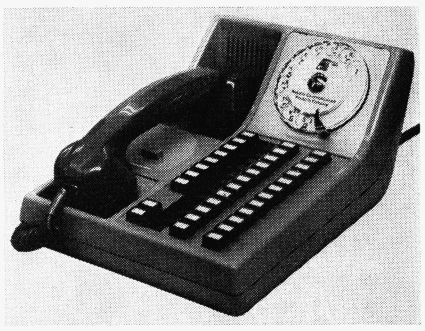
The Model LSG-231 multiplex stereo generator has a pilot signal frequency of 19 kHz with ±2-Hz accuracy. The 1-kHz audio signal is accurate to ±1%. Signal separation is rated at 50 dB with output voltage at 0 to 3 V rms continuously variable. Specifically useful in the field or on the work-

bench, this unit offers high reliability, precision, and stability. The LSG-231 has a dual power supply and measures 8 inches by 12 inches by 3½ inches. Use card or write *Leader Instruments Corporation, 37-27 Twenty-Seventh Street, Long Island City, New York 11101.*

For more info circle 193 on Reader Service Card

Electronic Key Telephone System

The Model SE-1070 key telephone system is designed for a capability of four to eight trunks and a maximum of 10 to 20 stations. The service station, with supervision capability, has the ability of transferring trunk calls and setting up an eight-party conference. It has automatic hold on trunk calls and can override any normal station. The normal station has trunk



call lamps and supervisory trunk lamps. Any normal station can answer any trunk call and transfer the call to any station. Use card or write *Reliable Communications Products Company, 11411 Addison Street, Franklin Park, Illinois 60131.*

For more info circle 194 on Reader Service Card

Microwave Link Alignment System

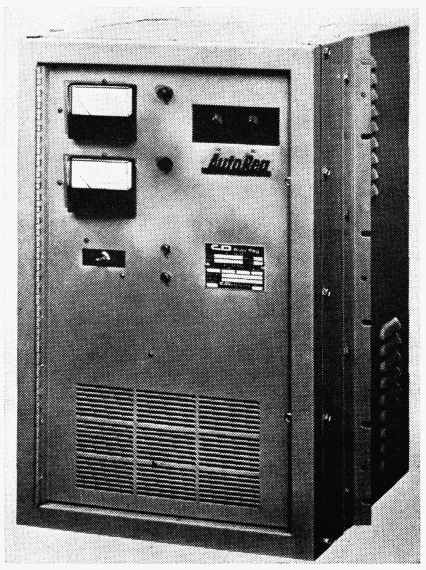
The Series 4600 link alignment system provides both a microwave signal and two-way voice communication to simplify the antenna alignment process. The alignment system consists of two small microwave transceivers with

two-way voice circuits operating at 6 GHz. Accessories include a remote meter, carrying case, battery pack, headset, and horn antennas for coarse alignment. Use card or write *Scientific-Atlanta, Post Office Box 13654, Atlanta, Georgia 30340.*

For more info circle 195 on Reader Service Card

Single-Phase 24 and 48-V Battery Chargers

The Series ARK line of single-phase 24 and 48-V AutoReg chargers offer ratings up to 7½ kW. Features include dual-voltage transformers with two-pole circuit breakers, changeover that does not require changing of circuit breaker or fuses, DC voltage adjustable ±10% in normal or equalize set-

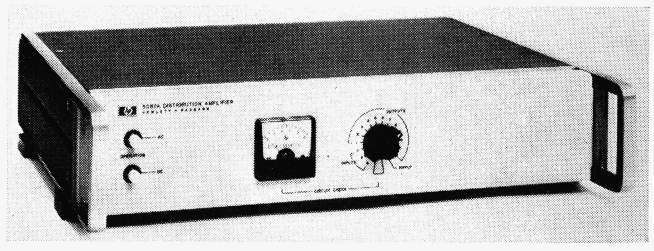


ting, ±1% voltage regulation from no load to full load with ±10% variations in the AC input voltage, and current limiting adjustable from 90% to 115% of rating. Series ARK can be used as a power supply. Use card or write *C & D Batteries, 3043 Walton Road, Plymouth Meeting, Pennsylvania 19462.*

For more info circle 196 on Reader Service Card

Distribution Amplifier Distributes Three Sources to 12 Outputs

The Model 5087A distribution amplifier will distribute up to three sources—10 MHz, 5 MHz, 1 MHz, or 100 kHz in any combination—to as many as 12 outputs. An optional capability takes a single 5-MHz input and delivers a choice of 0.1, 1, 5, and 10 MHz outputs. The same is possible with a single 10-MHz source. Output levels are individually adjustable from 0 to 3 V rms into 50 ohms; a front-panel



meter will monitor any one selected. Line-voltage fluctuations have no measurable effect on amplitude or phase of outputs, and there's an external 22-30-VDC connection for standby battery power. Use card or write *Hewlett-Packard Company, 1501 Page Mill Road, Palo Alto, California 94304.*

For more info circle 197 on Reader Service Card

Remote-Controlled Automatic Telephone-Answering System

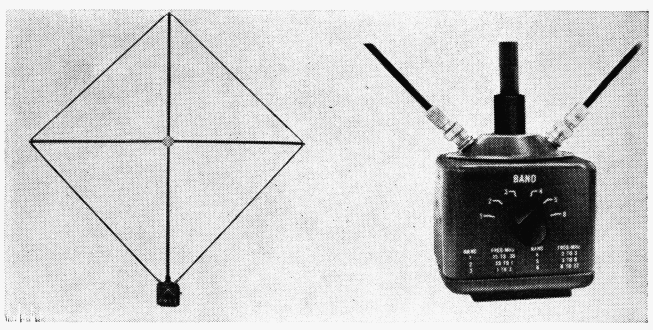
Phone Control II, an automatic telephone-answering system, features a state-of-the-art remote-control capability which allows the user to call in from any location and receive recorded telephone messages by remote control, even from telephone booths or mobile telephones thousands of miles away. This is accomplished through the use of a miniature hand-held, dual-tone oscillator (included), which is held near the telephone receiver and then sub-

sequently beeped. The dual-tone "beeper" remotely recycles the machine to play back all recorded messages and allows unlimited backspacing whenever desired to replay any message not understood. Recording time per incoming call can be manually set from 20 to 90 seconds, or may be switch-selected to automatic voice-control. Use card or write *Phone Control Systems, 18 Surrey Road, New Hyde Park, New York 11040.*

For more info circle 198 on Reader Service Card

Loop Antenna for 150 kHz to 32 MHz Magnetic Field Measurements

A loop antenna for magnetic field measurements in the range of 150 kHz to 32 MHz, consisting of coaxial cable supported on a mast, can be quickly dismantled for storage or transportation. It offers up to 16 dB greater sensitivity than smaller antennas due to the large area of the loop. Frequency coverage is accomplished by six switched

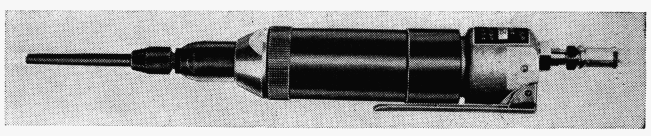


coupling transformers, each optimized for use in its particular band. The antenna may be used with any 50-ohm-input RFI meter or calibrated receiver to detect and measure magnetic field radiated signals. Use card or write *Singer Instrumentation, 3211 South LaCienega Boulevard, Los Angeles, California 90016.*

For more info circle 199 on Reader Service Card

Heavy-Duty Vertical Wire-Wrapping Tool

The Model AW-9T heavy-duty, vertical wire-wrapping tool is used especially for horizontal position wire-wrapping work. The tool can be used with a tool balancer. It produces a solderless wire-wrapped connection of "gas-tight" quality. The AW-9T accommodates wire sizes from



AWG 18 (1.0 mm) through AWG 28 (0.31 mm). The compact tool weighs only 19.5 ounces (550 grams) and comes with a 6-foot (2 meters) long flexible plastic air hose. Use card or write *OK Machine and Tool Corporation, 3455 Conner Street, Bronx, New York 10475.*

For more info circle 200 on Reader Service Card

Leave The Tuning To RADIO SHACK!

These Realistic Scanning Monitors automatically tune across 8 crystal-controlled VHF channels of your choice, then "lock in" when a transmission comes on. Keep you in tune to local police, fire, weather, business and more! They feature built-in power supplies for AC and 12 VDC, channel lock-out buttons, 2-second scan delay to prevent missed call-backs, crystal-lattice filters to cut interference, lots more! Accessory crystals low as $5.95 each.
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PRO-9

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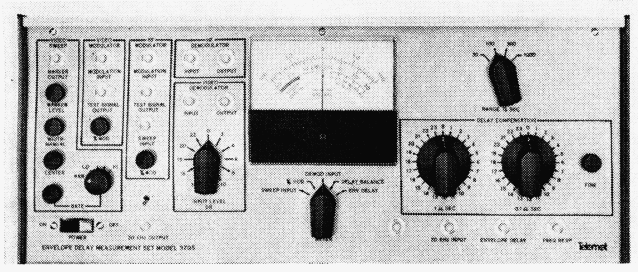
Circle 93 on Reader Service Card

Envelope Delay Measuring System

An envelope delay measuring system has a frequency range of 0.1 to 10 MHz for the video modulator and 25 to 250 MHz for the RF modulator. The unit has everything in one box and that includes a low harmonic content sweep

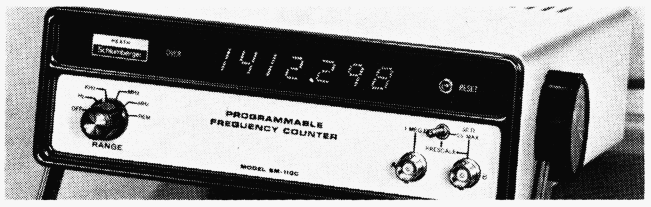


generator. Accuracy is said to be excellent, with delays of ±30 ns to ±1000 ns measured in four ranges, and resolution of 2 ns achieved. The test signal can be generated with inserted sync and blanking pulses allowing the user to measure envelope delay in clamped circuits. Use card or write *Telemet Company, Amityville, New York 11701.*

For more info circle 201 on Reader Service Card

Frequency Counters Cover 1 Hz to 200 MHz

The SM-110A Series of frequency counters offers a 1 Hz to 200 MHz range, separate 1 megohm and 50 ohm inputs, 10 mV input sensitivity, and a 1 MHz crystal time base stable to 7.5 ppm/year. The SM-110B provides range, inputs, and sensitivity identical to the SM-110A, and also includes features such as a high stability TCXO time base (1ppm/year) and complete remote programming capability. The



SM-110C includes all the features for the A and B models, including high stability TCXO an remote programming. It also includes a 600 MHz prescaler for high frequency input for measurements into the UHF region. Use card or write *Health/Schlumberger Scientific Instruments, Benton Harbor, Michigan 49022.*

For more info circle 204 on Reader Service Card

Microwave Synchronizer/ Stabilizer Covers 1-18 GHz

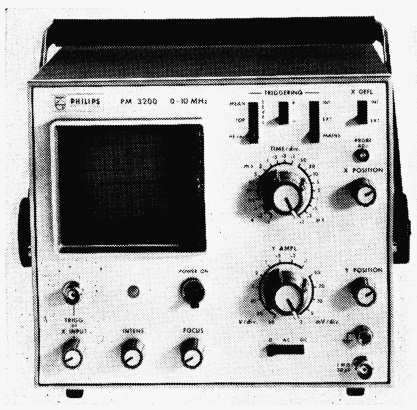
The Model 251 microwave synchronizer/stabilizer covers 1-18 GHz with no holes and features 1 part in 10^8/ second (10^7/day) frequency stability. The unit can impart crystal stability to any type of voltage-tunable microwave source. The 251 is continuously tunable over the 1-40 GHz range. It utilizes one built-in RF mixer covering 1-18 GHz and two plug-in mixers covering 18-26.5 GHz and

26.5-40 GHz respectively. Other features include −30 dBm to 0 dBh RF input sensitivity, 0.05 to 38 MHz/volt modulation sensitivity (switch selectable), 1000-ppm VCXO pulling range, and 3000-VDC high-voltage isolation. Use card or write *Sage Laboratories, 3 Huron Drive, Natick, Massachusetts 01760.*

For more info circle 205 on Reader Service Card

Portable Oscilloscope with FET Input Circuit

The input of the Model PM3200 portable oscilloscope has been converted from a cathode follower to FET circuitry, extending operating time on the optional battery pack from 4½ to 5½ hours. Vertical amplitude and time base are the only two controls used in normal operation; all other functions are automated. Triggering is fully automatic. The operator may select triggering on either the mean or

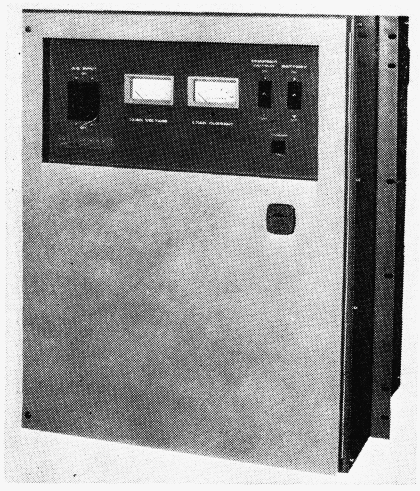


peak value of the AC component or may interpose a high-frequency filter in the trigger circuit to prevent triggering on noise. Sweep speed is selectable from 100 ns to 0.5 second per division in 21 calibrated steps, a five-million-to-one range. Use card or write *Test & Measuring Instruments. 224 Duffy Avenue, Hicksville, New York 11802.*

For more info circle 202 on Reader Service Card

Charger-Battery Unit Operates 12-VDC Load

A charger-battery unit, Model K20F14, is designed to operate a 12-VDC load such as a mobile radio unit from locations where commercial AC line power is available. The self-contained battery serves to power the unit during an AC power failure. Standard features include a low-maintenance lead-acid battery (75, 100, or 120 AH); charger output voltage adjustment from 12.9 to 14.7



VDC in .035-V steps; charger current limiter circuit; and output alarms and meters. Operating from nominal 110/220-V, 6O-Hz single-phase input, Model K20F14 provides 12-VDC nominal output rated at 20 A. Use card or write *Lorain Products Corporation, 1122 F Street, Lorain, Ohio 44052.*

For more info circle 203 on Reader Service Card

Why spend Millions for a Communication System when you only need 1/10 of its capability?

A major power utility was recently faced with a complete overhaul of their communication system due to requirements for increased computer/data handling capabilities. Quotations for microwave systems exceeded $2.5 million *without* the computer and supervisory control functions. With Lynch B950 power line carrier the total communication system cost about $750,000, *including* voice and data, supervisory control function and computer equipment. The B950 system provides a ten-fold increase in communication circuits, enough capacity to meet the needs of the new computer, provide dispatch and administrative talking channels and allow for future growth.

A unique Lynch-developed high-pass coupling technique greatly improves signal-to-noise ratios, reduces power requirements, eliminates line trap tuning with less installation and maintenance expenses, provides accurate impedance matching between the line and entrance cable, and maximum utilization of the available frequency band.

The B950 system assures you of toll quality circuits for your most demanding requirements with a choice of inband or out-of-band signaling and you can handle low or high speed data up to 2400 bits per second.

Call or write today for the full explanation on how Lynch can tailor your communication requirements to meet your needs now — and for the future.

LYNCH COMMUNICATION SYSTEMS
691 Bryant Street
San Francisco, California 94107
Telephone (415) 397-1471

Lynch POWER LINE CARRIER

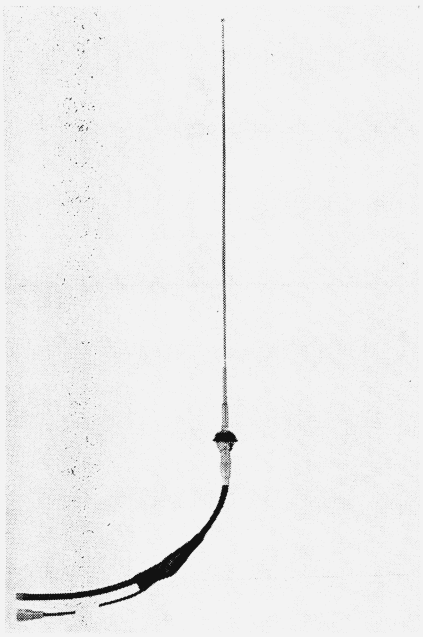
Circle 94 on Reader Service Card

New Items . . .

Continued from previous page

"Disguise" 144-174-MHz Mobile Antenna

Model ASP-748 "disguise" 144-174-MHz mobile communications antenna is designed to resemble exactly a conventional broadcast receive antenna. The antenna features a step-ground stainless-steel whip, underplated with copper and nickel to reduce power loss and deliver 2.5-dB gain. The antenna will accommodate 100-W RF power, with a VSWR less than 1.5:1.



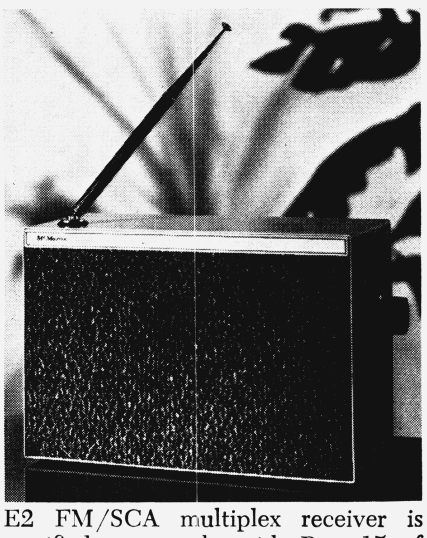
The antenna is furnished with a ball swivel base mount adjustable up to 35° slant. Model ASP-748 also may be used with Model ASP-619 coupler, permitting simultaneous use of both two-way and broadcast radios. Use card or write *The Antenna Specialists Company, 12435 Euclid Avenue, Cleveland, Ohio 44106.*

For more info circle 206 on Reader Service Card

Circle 95 on Reader Service Card

FM/SCA Self-Contained Multiplex Receiver

The Model TR-E2 multiplex receiver is a completely self-contained receiver designed for continuous use with controls consisting of a combination off/on switch and volume control, and a full-size 34-inch telescoping antenna included. Housed in a metal cabinet with a beige textured finish and front loudspeaker with fabric grill, the TR-

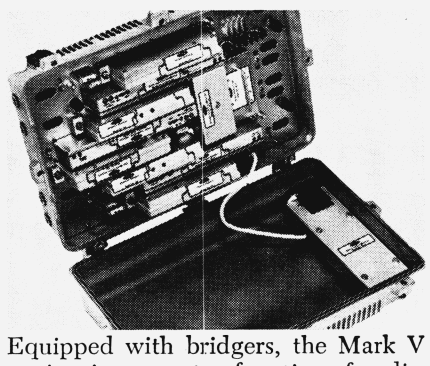


E2 FM/SCA multiplex receiver is certified to comply with Part 15 of the FCC rules and regulations. Optional features include a rear-mounted main/subchannel switch, headphone jack, and main/subchannel squelch. Use card or write *McMartin Industries, 605 North Thirteenth Street, Omaha, Nebraska 68102.*

For more info circle 207 on Reader Service Card

Bidirectional Single or Dual Cable Trunk Amplifier

The Super-Band Challenger Mark V trunk amplifier is designed for either single or dual cable operation with bidirectional capability available in one of the two cables. The complete bandwidth of 50 to 300 MHz is available in the forward direction while 5 to 32 MHz can be carried in the reverse.



Equipped with bridgers, the Mark V station incorporates functions for distribution from one or both cables and for return signals from bidirectional distribution. Use card or write *AEL Communications Corporation, Post Office Box 507, Lansdale, Pennsylvania 19446.*

For more info circle 208 on Reader Service Card

Rust-Inhibitor Lubricant Protects Metal Parts

The Type LPS 3 rust-inhibitor lubricant, which comes in aerosol spray or bulk, is a powerful inhibitor against moisture, salt, acid, and chemical atmospheric and soil conditions. One application stops rust two years or more and protects all metals against

deterioration. LPS 3 also penetrates and lubricates metal parts without harming nonmetallic components. Use card or write *Ameco, Incorporated, Post Office Box 13741, Phoenix, Arizona 85002.*

For more info circle 209 on Reader Service Card

Single-Row Television Time/Date Generator

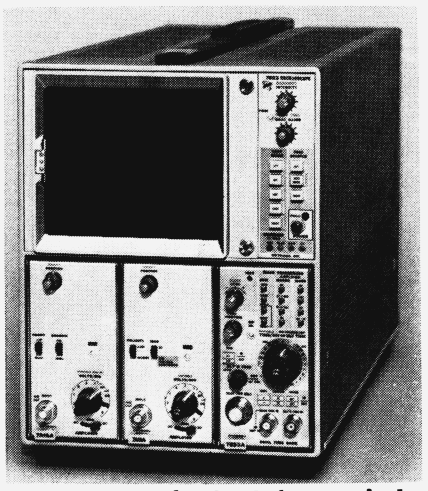
A television time/date generator, Model 3201, electronically produces a single-row display of current clock and calendar information on any stan-

dard TV raster. A typical example of the 25-character-space line is 12:37: 20 PM TUE JUL 18 '71; however, many format variations are available. Characters 28 TV lines in height are decoded from a standard 64-letter ASCII set. Timing accuracy is established either by power-line frequency or use of an external standard. Use card or write *Laird Telemedia, 2125 South West Temple, Salt Lake City, Utah 84115.*

For more info circle 210 on Reader Service Card

Oscilloscope Offers Five Operating Modes

The 7600 family of oscilloscopes offers the cabinet Model 7603 and the 5¼-inch rackmount Model R7603. Three plug-in compartments, two vertical channels, and five operating modes provide for combinations of measurements. The CRT readout gives an alphanumeric display of test

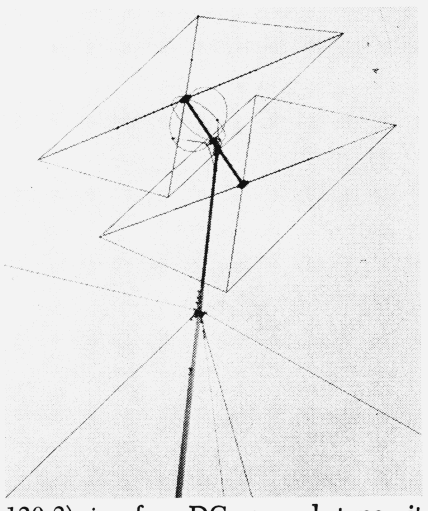


parameters on the CRT along with the measured waveform. The 8 x 10 div CRT features an internal graticule, variable illumination, and 15-kV accelerating voltage. Use card or write *Tektronix, Post Office Box 500, Beaverton, Oregon 97005.*

For more info circle 211 on Reader Service Card

CB Antenna with New Gamma Matching System

A new version of the P.D.L. antenna uses an orbital gamma system to give a better match on both polarities. The higher efficiency matching raises the gain figures from 11 to 12 dB and increases the rejection from 30 to 32 dB. Because the P.D.L. II (Model AV-



120-2) is of a DC ground type, it gives positive lightning protection and raises the power-handling capacity to over 2000 W. Use card or write *Avanti Research and Development, 33-35 West Fullerton Avenue, Addison, Illinois 61010.*

For more info circle 212 on Reader Service Card

Scaler Extends Range of 6-MHz Counter to 600 MHz

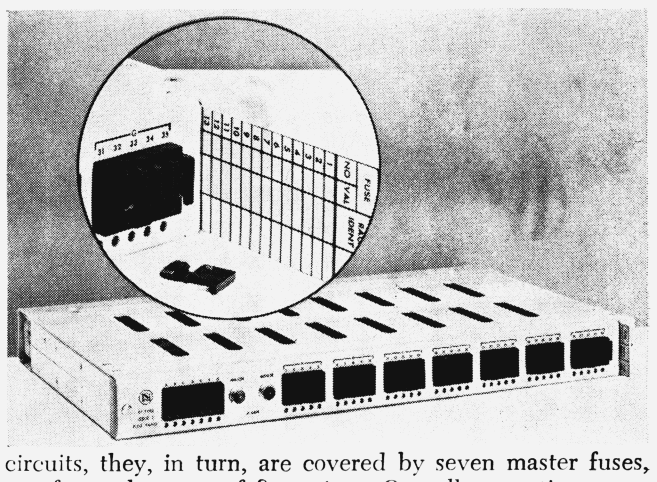
The Model SM-114A scaler extends the range of any counter with 6 MHz capability to 600 MHz. Three push-button selected ranges allow division of 1, 10, and 100. The divide-by-one range provides for direct transmission of frequencies for 10 MHz to 100 MHz; the 10 and 100 ranges will scale frequencies between 40 MHz and 600 MHz. The SM-114A provides a one volt peak-to-peak out-

put (capable of driving almost all counters) and requires only 50 mV rms from the signal source, resulting in a gain of 17 dB. Use card or write *Heath/Schlumberger Scientific Instruments, Benton Harbor, Michigan 49022.*

For more info circle 213 on Reader Service Card

Fuse Panel Protects 35 Circuits in Telephone Central Office

A new fuse panel, designated the FP-7195, for the protection of circuits in a telephone central exchange office is capable of protecting 35 individual circuits while occupying a rack space only 1¾ inches high. The fuse panel houses 35 communication-type fuses that indicate when blown, and are easily removable from the front of the panel. While these individual fuses protect the 35 minor

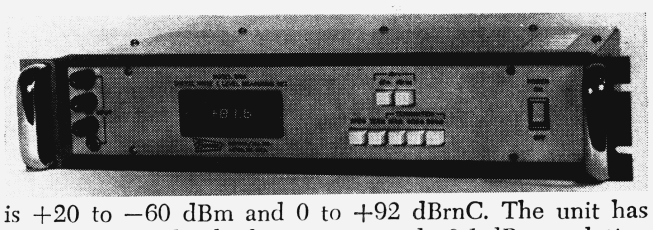


circuits, they, in turn, are covered by seven master fuses, one for each group of five minor. Overall protection capability is 70 A maximum. Use card or write *Lear Siegler, Electronic Instrumentation, 714 North Brookhurst, Anaheim, California 92803.*

For more info circle 214 on Reader Service Card

Digital Noise and Level Measuring Set

A digital noise and level measuring set designated 816A provides fast, accurate measurement of transmission level, flat weighted noise, and C-Message weighted noise with automatic ranging. The 816A is available with an optional C-notched or C-slot filter. Frequency range is 50 Hz to 110 kHz flat or C-Message weighted. Measurement range

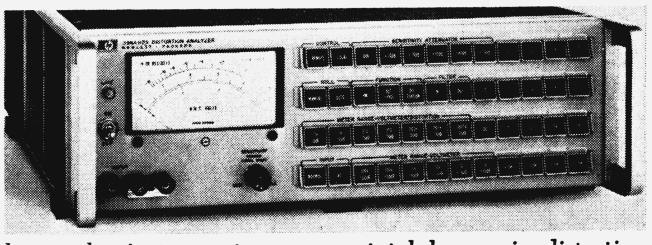


is +20 to −60 dBm and 0 to +92 dBrnC. The unit has a 0.1-dB total absolute error and 0.1-dB resolution on dBm. On dBrnC, the total error is 0.5 dB and the resolution is 1 dB, automatically rounded to the nearest whole dB. Use card or write *Bowmar/ALI, Incorporated, 531 Main Street, Acton, Massachusetts 01720.*

For more info circle 215 on Reader Service Card

Distortion Analyzer/ AC Voltmeter

A new distortion analyzer/AC voltmeter, Model 334A-H25, has all the capabilities of the standard Model 334 plus complete programmability of all functions, ranges, and settings. Remote control is by parallel BCD TTL logic. A DC output and an interrogation circuit have been added so that an external controller can determine the status of the instrument during measurements. As a distortion ana-

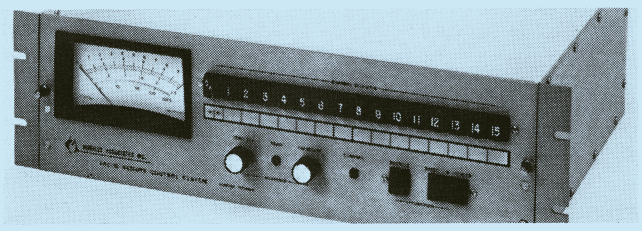


lyzer, the instrument measures total harmonic distortion from 0.1% to 100% full scale in seven ranges. The fundamental frequency range for distortion measurements is from 10 Hz to 100 kHz; harmonics are indicated up to 1 MHz. Use card or write *Hewlett-Packard Company, 1501 Page Mill Road, Palo Alto, California 94304.*

For more info circle 216 on Reader Service Card

Remote-Control System Eliminates Rotating Stepper Switches

The TRC-15A remote-control system eliminates rotating stepper switches. Individual relays in the 15-channel system have replaced the stepper switch. All relays are socketed and retained by a spring clip simplifying replacement. Complete shielding in both studio and transmitter units makes the TRC-15A immune to RF energy. A second shielded compartment is provided in the transmitter unit to further isolate the circuitry from high RF fields. Two versions of the TRC-15A are available—the TRC-15AW

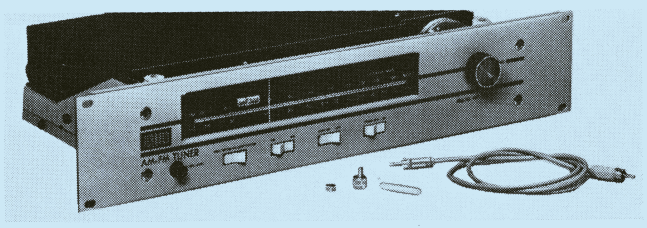


for operation over a single telephone line, and the TRC-15-AR for total wireless operation. Use card or write *Moseley Associates, 111 Castilian Drive, Goleta, California 93017.*

For more info circle 217 on Reader Service Card

Solid-State High-Fidelity AM/FM Tuner for MATV and CATV Head Ends

A solid-state high-fidelity AM/FM tuner, designated AFT-2002, is designed specifically for MATV and CATV head ends. The unit features an FET front end, microcircuitry, and FM interchannel hush. The AFT-2002 also has a front-

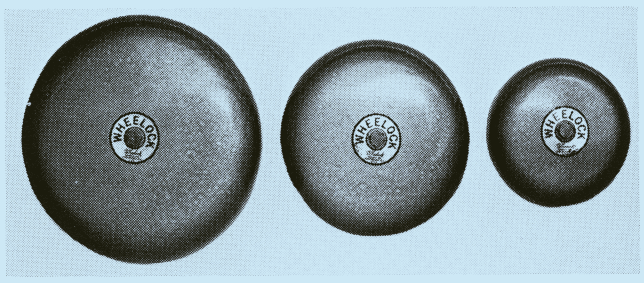


panel meter which indicates either zero center (to simplify tuning) or signal-strength peak, depending on the position of the meter switch. The output of the tuner is 1.2 V, audio. Front-panel controls include tuning, on/off, audio level control, AM/FM selection, and interchannel-hush defeat switch. Use card or write *Jerrold Electronics Corporation, 401 Walnut Street, Philadelphia, Pennsylvania 19105.*

For more info circle 220 on Reader Service Card

Low-Power-Consumption Alarm Bells

Low-power-consumption alarm bells consume only 1.5 W or less during operation. They are available in three sizes, 6 inches, 8 inches, and 10 inches, and can be used either in-



door or outdoor. The Series 45 bells are DC vibrating units which give maximum dB ratings with minimum power consumption. The Series 46 Bells have the same power requirements and dB ratings but contain a series diode for use in supervised systems. Use card or write *Wheelock Signals, 273 Branchport Avenue, Long Branch, New Jersey 07740.*

For more info circle 221 on Reader Service Card

Aerial Device Mounts on Trucks

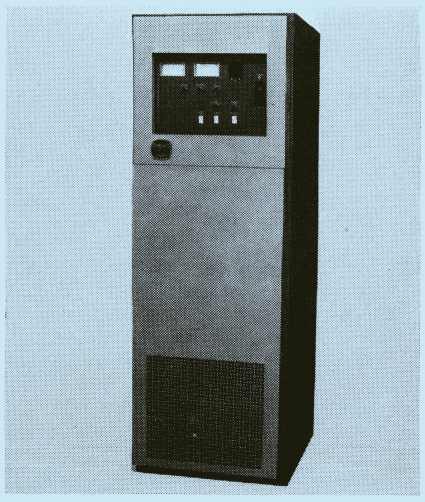
The MobiLift aerial device is available in 24 and 28-foot (one man) ground-to-bucket heights, with steel booms only on the 24-footer and a choice of steel or Epoxiglas insulated upper boom on the 28-foot model. The MobiLift is a fully articulated aerial device that mounts on trucks as small as 54-inch (cab-to-axle). The device

is stable without outriggers. MobiLift aerial devices can put 300 pound bucket payloads (operator, tools, and so forth) where the work is located. Use card or write *A. B. Chance Company, Pitman Manufacturing Company Division, Post Office Box 120, Grandview, Missouri 64030.*

For more info circle 218 on Reader Service Card

Single-Phase, Solid-State Inverters

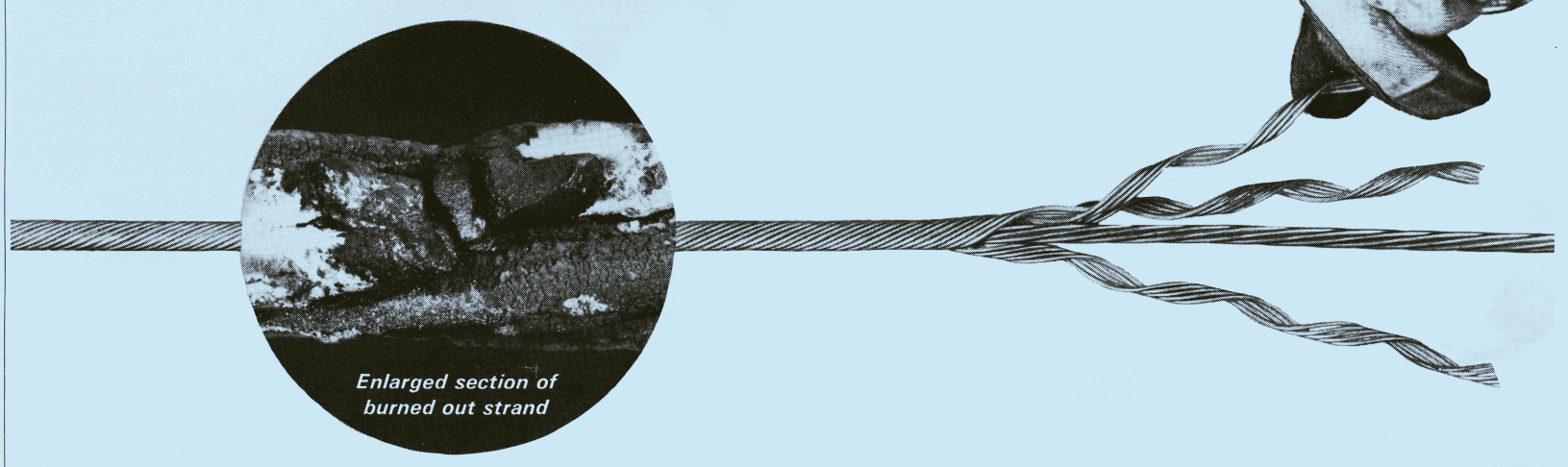
Two new single-phase, solid-state inverters are ideal for a wide variety of load applications including operation of small power supplies, motor loads, standby telephone exchange equipment, remote computer terminals, AC-operated microwave systems, and critical instrumentation equipment. The Model WAQ-502B provides 5,000-VA capacity, while the Model



WAQ103B is rated at 10,000 VA. Both units utilize a ferroresonant regulator circuit that provides inherent voltage regulation, sine-wave output of low harmonic content, and self protection against overloads or short circuits. Use card or write *Lorain Products Corporation, 1122 F Street, Lorain, Ohio 44052.*

For more info circle 219 on Reader Service Card

Only seconds ago there was a damaged strand here



Enlarged section of burned out strand

Safe, permanent repair quickly made with PREFORMED Strand Splice

By no other means could this have been accomplished more effectively and less expensively. Reasons?

1. Applied by hand; no tools needed.
2. No need to cut the strand to receive the splice.
3. PREFORMED Splices permit visible inspection for assurance of lasting safety.
4. Uniform application from splice to splice . . . every time.
5. Lowest installed cost.
6. Full electrical and mechanical strength restored.
7. PREFORMED Splices flex with the strand.
8. No concentrated stresses; holding power is distributed over a longer segment of strand.
9. Full range of corrosion-resistant materials compatible with the strand.
10. Neat, slim profile permits uninterrupted operation of cable spinner.

Use PREFORMED Strand Splices to repair strand burned by lightning or power conductors; fatigue damage at strand suspension clamps; guy-wire damage.

Send for Data Folio on PREFORMED strand accessories.
PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland, Ohio 44103; dial 216-881-4900.

PREFORMED
MAKES BETTER CONNECTIONS EVERYWHERE

Circle 96 on Reader Service Card

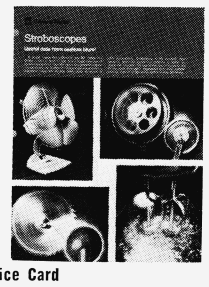
Literature

Useful product information you can send for FREE

SYSTEMS FOLD-OUT BROCHURE covers a total communications concept for bus transit operations. The illustrated brochure provides complete details on this flexible, expandable system which provides both voice and data communications to meet changing service demands without equipment obsolescence. Use card or write *Motorola Communications and Electronics, 1301 East Algonquin Road, Schaumburg, Illinois 60172.*

For more info circle 232 on Reader Service Card

STROBE-EQUIPMENT PAMPHLET includes detailed specifications and applications information on a broad selection of electronic strobe equipment. Nine different strobes are described, and a wide variety of accessories including photo-electric pickups are discussed. Use card or write *General Radio, 300 Baker Avenue, Concord, Massachusetts 01742.*

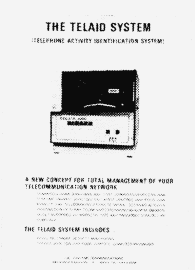


For more info circle 233 on Reader Service Card

INTERCOM-SYSTEMS FOLDER points out the significant savings in phone bills that can be realized through the use of the company's intercom systems. The folder also discusses other intercom cost savings in freeing telephone lines, saving staff time, and increasing communications efficiency, and offers customers a free feasibility study to determine their needs. Use card or write *Philips Business Systems, 100 East 42nd Street, New York, New York 10017.*

For more info circle 234 on Reader Service Card

PRODUCT BROCHURE describes and illustrates the Telaid telephone activity identification system which includes total telephone activity monitoring and traffic analysis and audit-control computer programs. The recording system, options, software, and processing services are discussed. Use card or write *Cal Systems, 6660 Reseda Boulevard, Reseda, California 91335.*

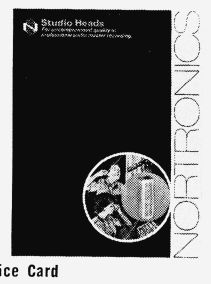


For more info circle 235 on Reader Service Card

PRODUCT BULLETIN describes and illustrates the "JP" Series of modular jack panels which accept up to 56 telephone jacks mounted to 14 module inserts. Panel components, color coding, terminations, jack panel expansion, special jack panel assemblies, custom wired assemblies, ordering information, and material specifications are discussed. Use card or write *Switchcraft, 5555 North Elton Avenue, Chicago, Illinois 60630.*

For more info circle 236 on Reader Service Card

DESIGN CATALOG describes magnetic heads for professional audio master recording. The catalog details mechanical and electrical characteristics and specifications for four-channel head for ½-inch tape, eight- and 12-channel heads for 1-inch tape, and 16 and 24-channel heads for 2-inch tape. Use card or write *Nortronics Company, 8101 Tenth Avenue North, Minneapolis, Minnesota 55427.*

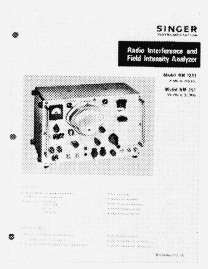


For more info circle 237 on Reader Service Card

APPLICATION PAPER covers some fundamentals of coaxial cables. The paper, written in a question-and-answer style, covers such items as how to figure dB losses in a line and how to determine the optimum impedance of a cable. Use card or write *Tektronix, Post Office Box 500-A, Beaverton, Oregon 97005.*

For more info circle 238 on Reader Service Card

METERS LITERATURE features the Models NM-12AT and NM-25T field-intensity meters which operate over the ranges 10 kHz to 250 kHz and 150 kHz to 32 MHz respectively. Complete specifications, block diagram, applications, and accessories are given. Use card or write *Singer Instrumentation, 3211 South LaCienega Boulevard, Los Angeles, California 90016.*

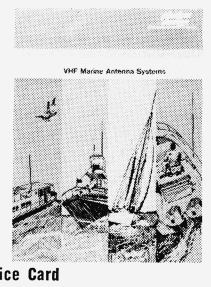


For more info circle 239 on Reader Service Card

TOOL-KIT BROCHURE presents six professional tool kits, each engineer-designed to do a particular job. Included in the brochure are the JTK-17 field-engineer kit, which contains over 100 tools; the JTK-2 electronic technician kit for industrial personnel; the JTK-16 compact "detective" kit, which contains 30 multipurpose tools in a zipper case; and many more. Use card or write *Jansen Tools and Alloys, 4117 North 44th Street, Phoenix, Arizona 85018.*

For more info circle 240 on Reader Service Card

ANTENNAS GUIDE features a series of VHF marine antennas designed for operation in the 156-162.55-MHz range. The illustrated guide shows the five basic model antennas and includes complete mechanical and electrical specifications on each one. Use card or write *Phelps Dodge Communications Company, Route #79, Marlboro, New Jersey 07746.*



For more info circle 241 on Reader Service Card

TELEPHONE-CORDS BULLETIN features a complete line of straight, retractile, and armored telephone cords. The six-page bulletin describes the most frequently ordered cords, the colors in which they are available, and their combinations of lengths and number of conductors. Construction is also described. Use card or write *Communication Specialties, 6405 Metcalf Avenue, Overland Park, Kansas 66202.*

For more info circle 242 on Reader Service Card

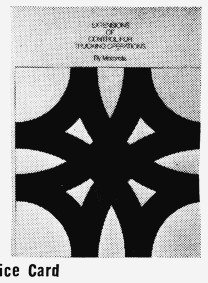
PRODUCT FOLDER details the "Cabuckle" lightweight cable-tensioning device in 1/16-inch to 3/16-inch cable diameter sizes. The folder contains a general description, illustrations, and convenient specification tables including size, tensile strength, weight, sleeve part number, cross-piece part number, and other information. Use card or write *Shinn Engineering, 320 Dyer Road, Santa Ana, California 92707.*

For more info circle 243 on Reader Service Card

COMPONENT CATALOG discusses an entire solid-state component line including high-frequency transistors, YIG-tuned oscillators, unit amplifiers, thin film MIC amp and GPD cascadable amplifier modules, as well as dual inline packaged thin film amplifiers for operation to 4 GHz. Photographs, applications, mounting, installation, ordering, and optional features are covered. Use card or write *Avantek, 2981 Copper Road, Santa Clara, California 95051.*

For more info circle 244 on Reader Service Card

TRUCKING FOLDER covers the subject of extensions of control for the trucking-operations industry. The folder describes how voice, visual, remote control, and data communications systems are solving management problems in every area of trucking operations. Use card or write *Motorola Communications and Electronics, 1301 East Algonquin Road, Schaumburg, Illinois 60172.*

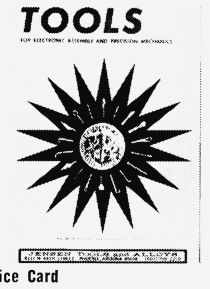


For more info circle 245 on Reader Service Card

POWER-AMPLIFIERS PAMPHLET covers RF power amplifiers with frequency ranges of 150 kHz to 500 MHz, ranging in power output from 300 milliwatts to over 100 watts. A general description, features, applications, and brief specifications are included. Use card or write *Electronic Navigation Industries, 3000 Winton Road South, Rochester, New York 14623.*

For more info circle 246 on Reader Service Card

TOOL MANUAL describes and illustrates over 1900 individual items including screwdrivers, wrenches, pliers, tweezers, files, shears, knives, microtools, relay tools, power tools, metalworking tools, wire strippers, soldering equipment, and more. Four pages of technical data on tool selection is also provided. Use card or write *Jensen Tools and Alloys, 4117 North 44th Street, Phoenix, Arizona 85018.*

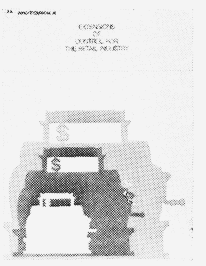


For more info circle 247 on Reader Service Card

CATALOG SHEET on grounding materials for subscriber locations features single and dual splice-type grounding blocks with CF-61A connectors such as CGB-3 standard single and CGB-4 standard dual. Also featured are outdoor types SGB-1 and SGB-2, enclosed in alloy housings, with surge protection on the latter. Use card or write *The Magnavox Company, CATV Division, 133 West Seneca Street, Manlius, New York 13104.*

For more info circle 248 on Reader Service Card

CONTROL BROCHURE details extensions of control for the retail industry. The 12-page brochure describes some of the systems the company offers, and the problems they can solve for the retailer. Each system is individually tailored to meet the specific needs of a particular retailer. Use card or write *Motorola Communications and Electronics, 1301 East Algonquin Road, Schaumburg, Illinois 60172.*



For more info circle 249 on Reader Service Card

CAPABILITY SHORT-FORM CATALOG describes and illustrates potentiometers, trimmers, resistor modules, hybrid circuits, rotary selector switches, and frequency-control devices. Complete sales office listings are also included. Use card or write *CTS Corporation, 905 North West Boulevard, Elkhart, Indiana 46514.*

For more info circle 250 on Reader Service Card

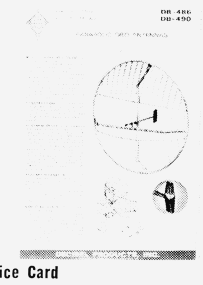
SWITCHES FOLDER details the design and application of a series of solid-state lifetime switches. Theory of operation, the standard and custom designs available, switch configurations, and applications are presented. Use card or write *Magic Dot, Incorporated, 40 Washington Avenue South, Minneapolis, Minnesota 55401.*

For more info circle 251 on Reader Service Card

CONNECTOR CATALOGS detail rectangular connectors. The catalogs describe subminiature, size 22 contacts (W-Series); miniature, size 20 contacts (D-Series); standard, size 16 contacts (M-Series); and the C-21 environmental connectors featuring a moisture-sealing concept. Use card or write *Hughes Connecting Devices, 500 Superior Avenue, Newport Beach, California 92663.*

For more info circle 252 on Reader Service Card

ANTENNAS DATA SHEET features the Models DB-486 and DB-490 parabolic grid antennas for use in the 890-960-MHz band. Information on construction, electrical design, standard termination, mounting brackets, radiation patterns, and specifications are supplied. Use card or write *Decibel Products, 3184 Quebec Street, Dallas, Texas 75247.*



For more info circle 253 on Reader Service Card

DIRECTIONAL-TAPS LITERATURE describes the 2900 Series modular overhead directional taps. Key features, illustrations, and complete specifications are given for the 5-to-300-MHz lines. Covered are six two-output units in values of from 7 to 25 dB, six four-output units in values of from 10 to 29 dB, and others. Use card or write *The Magnavox Company, CATV Division, 133 West Seneca Street, Manlius, New York 13104.*

For more info circle 254 on Reader Service Card

EQUIPMENT MANUAL presents a large selection of electronic kits such as color TVs, 12- to 25-inch models with built-in service tools; audio equipment, featuring four-channel components and a cassette deck; marine gear; amateur radio equipment; and more. Numerous illustrations are also supplied. Use card or write *Heath Company, 305 Territorial Road, Benton Harbor, Michigan 49022.*

For more info circle 255 on Reader Service Card

Circle 97 on Reader Service Card

PROCEDURE MANUAL outlines the procedures available to the members of the public interested in the quality of broadcasting services. The pamphlet provides practical advice concerning the use of formal and informal methods for members of the community to convey complaints to the FCC and to participate in proceedings in which the performance of a station is judged and legitimate grievances are redressed. Use card or write *Federal Communications Commission, 1919 M Street, Northwest, Washington, D.C. 20554.*

For more info circle 256 on Reader Service Card

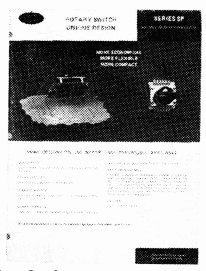
CONTROL-SYSTEM BROCHURE details the TALIX management-control system for accurate, profitable management of hotel/motel operations. The brochure covers components, check-ins, check-outs, pick-ups, the supervisory panel, spotting errors, and service and installation. Use card or write *Varian/Talix, A Division of Varian Associates, 750 North Pastoria Avenue, Sunnyvale, California 94086.*

For more info circle 257 on Reader Service Card

EQUIPMENT CATALOG shows a line of interface equipment including coaxial patching, switching, cables, and connectors as used in instrumentation, communications carrier, TV, computer, video, digital transmission, and similar applications. Also included in the catalog is a technical paper on the proper methods of interconnecting equipment. Use card or write *Trompeter Electronics, 8936 Comanche Avenue, Chatsworth, California 91311.*

For more info circle 253 on Reader Service Card

INFORMATION BROCHURE describes and illustrates the Series SP rotary switches. The brochure also lists electrical ratings, electrical and environmental characteristics, over 1,000,000-operations life, and quality-control standards. The different versions available are described. Use card or write *Chicago Dynamic Industries, 1725 Diversey Boulevard, Chicago, Illinois 60614.*

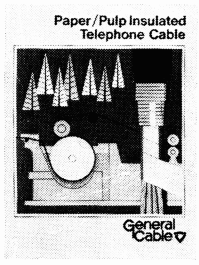


For more info circle 258 on Reader Service Card

TRANSISTOR MANUAL presents a line of metal can, epoxy, and TO-92 transistors. Over 500 different products are listed with complete operating parameters as well as physical characteristics. A section is included which describes the extensive qualification testing the devices are put through to ensure reliability and performance. Use card or write *Carter Semiconductor, 6901 Jericho Turnpike, Syosset, New York 11791.*

For more info circle 260 on Reader Service Card

CABLE BOOKLET covers the corporation's production capacity, product quality, and research, development, and engineering contributions to cable design and manufacture. The booklet contains information on Stalpeth, DS-Stalpeth, Stalpeth CCW, and Lead and Lepeth sheathed cables. Use card or write *General Cable Corporation, 730 Third Avenue, New York, New York 10017.*

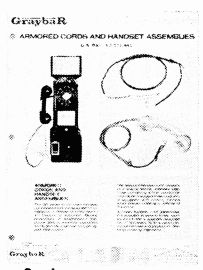


For more info circle 261 on Reader Service Card

SALES CATALOG describes a variety of telephones, dictating, and business equipment highlighting the company's programmable automatic telephone-answering systems. Other items include the Grundig Stenorette SL, the Phillips/Norelco Models 84 and 86, many dictating accessories, an automatic postage-stamp affixer, telephone diverters and conferences, and more. Use card or write *The ANSWER/Line Associates, 82-61 165th Street, Jamaica, New York 11432.*

For more info circle 262 on Reader Service Card

CORDS LITERATURE presents a line of armored cords and handset assemblies. A general description, photographs, and ordering information is included. The GB-H4DA-PM panel-mounting armored cord adapter is also described and illustrated. Use card or write *Allen Tel Products, 2211 South Susan Street, Santa Ana, California 92704.*

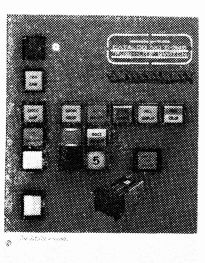


For more info circle 263 on Reader Service Card

COMPONENTS CATALOG consists of 168 pages covering rotating components including motors, blowers, gear reducers, controls, and related items. Items are fully illustrated, indexed, and accurately described. Use card or write *Electro Sales, Rotating and Electronic Components, 100 Fellsway West at Mystic Avenue, Somerville, Massachusetts 02145.*

For more info circle 264 on Reader Service Card

PUSH-BUTTON SWITCH BROCHURE outlines the 5-A Series PL "Push-Lite" switch which is available with 1-C or 2-C switching, and is rated at 5 A, 250 VAC, noninductive load. The brochure discusses display and color arrangement, front-of-panel relamping, front-of-panel mounting, and components. Use card or write *Switchcraft, 5555 North Elston Avenue, Chicago, Illinois 60630.*



For more info circle 265 on Reader Service Card

HANDY POCKET MANUAL gives complete instructions for joining PVC plastic pipe and fittings. Illustrations are also provided. Use card or write *Industrial Polychemical Service, Department PM167, Post Office Box 471, Gardena, California 90247.*

For more info circle 266 on Reader Service Card

PRODUCTS BULLETIN contains descriptions and specifications on omnidirectional high-gain antennas, VHF and UHF CATV antennas, broadband log periodics, arrays and systems, as well as special-purpose antennas. Illustrations are also included. Use card or write *Instruments for Industry, 151 Toledo Street, Farmingdale, New York, 11735.*

For more info circle 267 on Reader Service Card

EQUIPMENT LITERATURE includes four separate brochures describing the Series 208 speech-plus-tone signaling systems for remote base-station control, Series 280 sub-tone (CTCSS) encoders and encoder/decoders, the Model 175 burst tone encoder/decoder with Page-Alert capability, and the Series 300 voice band tone control signaling systems. Features, applications, and specifications are provided in the brochures. Use card or write *Vega Electronics, 3000 West Warner, Santa Ana, California 92704.*

For more info circle 268 on Reader Service Card

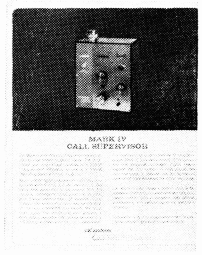
TEST-RECEIVER BROCHURE provides major features, design characteristics, construction details, specifications, applications, and a accessory information for the Model LFR-100 Tempest test receiver. Illustrations are also included. Use card or write *American Electronic Laboratories, Post Office Box 552, Lansdale, Pennsylvania 19446.*

For more info circle 269 on Reader Service Card

SCIENTIFIC BOOK MANUAL features over 400 popular hardbound and paperback books covering topics such as electronics, electricity, amateur radio, audio and hi-fi, mathematics, plus Audel do-it-yourself books on appliances, mechanical power, sheet metal, and others. The books are written in easy-to-understand language, and made completely clear with show-how photographs and drawings. Use card or write *Howard W. Sams and Company, 4300 West 62nd Street, Indianapolis, Indiana 46268.*

For more info circle 270 on Reader Service Card

SYSTEM DATA SHEET presents the Mark IV call supervisor which incorporates visible lights to indicate when a telephone line is in use and when the call is in the alert period. A complete description outlining features and an illustration are provided. Use card or write *Cal Systems, 6660 Reseda Boulevard, Reseda, California 91335.*

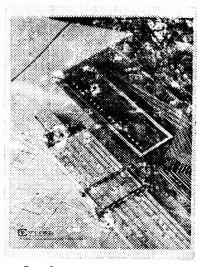


For more info circle 271 on Reader Service Card

POWER-SYSTEMS BULLETIN contains vital information needed in the selection of preengineered static uninterruptible AC power systems. Data on single-phase units (0.25 to 7.5 kVA) and three-phase units (6 to 22 kVA) for operation on 50 and 60-Hz lines is provided in the bulletin. Phase, protection time, dimensions, and weights are supplied for the power systems. Use card or write *Cyberex, Incorporated, 4399 Industrial Parkway, Willoughby, Ohio 44094.*

For more info circle 272 on Reader Service Card

METERING-SYSTEMS SHEET describes and illustrates the Model 2900B local message-metering system which automatically records data such as subscriber directory number, zone called, call duration, and time of termination. Other features and specifications are also provided. Use card or write *VITEL, 77 Ortega Avenue, Mountain View, California 94041.*



For more info circle 273 on Reader Service Card

APPLICATION NOTE discusses lock-in amplifier theory and operation. The note divides the lock-in amplifier into functional blocks, and provides a discussion of each of the blocks as well as their interrelationship. Included are such topics as the phase-sensitive detector, the filtering characteristics of a lock-in, and the signal-to-noise improvement that may be achieved with a lock-in. Use card or write *ITHACO, 735 West Clinton Street, Ithaca, New York 14850.*

For more info circle 274 on Reader Service Card

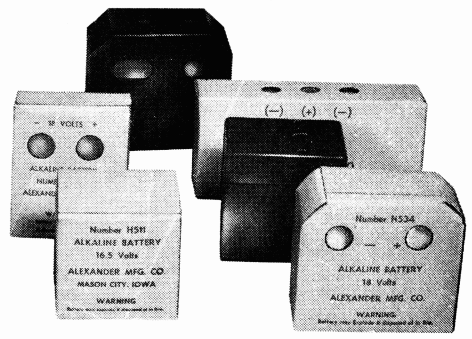
RESTRICTOR DATA SHEET describes and illustrates the "Tol-Loc" electronic monitor that stops unauthorized toll calls on the user's telephone. The data sheet discusses the toll-call problem, the solution, how Tol-Loc works, and installation. Use card or write *Tra-C Labs, 8074 Engineer Road, San Diego, California 92111.*

For more info circle 275 on Reader Service Card

TECHNICAL PAMPHLET describes the techniques used in generating maps from remote sensor data from spacecraft. The illustrated pamphlet describes how a Model 55C reflecting projector simplifies and speeds up the job of reducing data (from side-looking radar, microwave, and infrared imagers and multispectral photography) to usable form (maps, charts, and others) in required scale. Use card or write *Map-O-Graph Division, Art-O-Graph, Incorporated, 529 South Seventh Street, Minneapolis, Minnesota 55415.*

For more info circle 276 on Reader Service Card

SAVE!..



COMMUNICATIONS BATTERIES

A complete line of alkaline, mercury, and ni-cad batteries for Portable Transceivers and Pagers . . . IMMEDIATE DELIVERY.

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ALEXANDER Manufacturing Co.
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Circle 93 on Reader Service Card

DRAKE Model DSR-1 COMMUNICATIONS RECEIVER

- Continuous coverage 10 kHz to 30 MHz
- Digital synthesizer frequency control
- Frequency displayed to 100 Hz
- All solid state
- AM, SSB, CW, RTTY, ISB
- Series balanced gate noise blanker
- Rack or desk mount
- Accessories available to accommodate specific requirements

SPECIFICATIONS • **Frequency Range:** 10 kHz to 30.0 MHz • **Modes of Operation:** USB, LSB, CW, RTTY, AM, ISB. • **Frequency Readout:** Complete to 100 Hz on six NIXIE tubes. • **Frequency Selection:** 10 MHz, 1 MHz, 0.1 MHz switch selected. 0 to 0.1 MHz continuously variable. • **Frequency Stability:** Frequency drift less than 200 Hz in any 8 hour period at constant ambient temperature between 0° to 40° C and constant line voltage after 1 hour warm up. • **BFO:** Derived from 5 MHz standard oscillator or variable ±3 kHz from front panel. • **Sensitivity: 0.01 - 0.5 MHz:** Less than 4 μV for 10 dB SINAD at 2.4 kHz SSB mode. Less than 25 μV for 10 dB SINAD at 6 kHz AM mode with 30% modulation. **0.5 - 30 MHz:** Less than 0.3 μV for 10 dB SINAD at 2.4 kHz SSB mode. Less than 2.0 μV for 10 dB SINAD at 6 kHz AM mode with 30% modulation. • **Image Rejection:** Greater than 70 dB relative to 1 μV below 10 MHz. Greater than 60 dB relative to 1 μV above 10 MHz. • **Blocking:** Greater than 100 dB relative to 1 μV. • **Crossmodulation:** 70 dB relative to 1 μV. • **Intermodulation:** 70 dB relative to 1 μV. • **Opposite Sideband Suppression:** Greater than 60 dB at 500 Hz into the opposite sideband. • **I.F. Band-width:** 6 kHz, 2.4 kHz, 1.2 kHz, 0.4 kHz; Selectivity @ -6 dB: 6 kHz, 2.4 kHz, 1.2 kHz, 0.4 kHz; @ -60 dB: 11.5 kHz, 4.3 kHz, 2.4 kHz, 0.8 kHz; Optional filters available for other bandwidths. • **Automatic Gain Control:** Audio output rises less than 3 dB for RF input change of 1 μV to 100 mV. Attack Time: 100 μs Release Time: 750 ms (slow AGC), 25 ms (fast AGC) • **Antenna Input Impedance:** 10 kHz to 500 kHz 1000 ohms, 500 kHz to 30 MHz 50 ohms • **Audio Output:** 2 watts at 5% max. distortion into 4 ohm load. 4 ohm unbalanced and two 600 ohm balanced outputs. ISB output is one of the two 600 ohm balanced outputs. • **Audio Hum and Noise:** Greater than 60 dB below rated output. • **Power:** 115/230 volts ±10% single phase 50-420 Hz 15 watts. • **Dimensions:** 5.25 in. H x 19 in. W. x 15 in. D (13.3 cm H x 48 cm W x 38 cm D) 17 lbs. (7.7 kg)

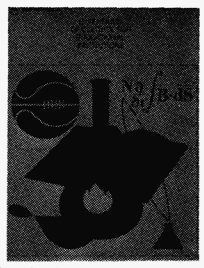
Write to . . . Dept. C.
Commercial Division,
DRAKE
R. L. DRAKE COMPANY
540 Richard St., Miamisburg, Ohio 45342
Phone: (513) 866-2421 Telex: 288-017

Circle 99 on Reader Service Card

Literature . . .

Continued from previous page

APPLICATION BOOKLET discusses extensions of control for educational institutions. The booklet describes how voice, visual, remote-control, and data-communications systems can solve problems for educational institutions. Use card or write *Motorola Communications and Electronics, 1301 East Algonquin Road, Schaumburg, Illinois 60172.*



For more info circle 277 on Reader Service Card

DESIGN DIGEST covers ½-inch IBM-compatible plus 1-inch and 2-inch heads for digital recording applications. The digest includes eight pages of depth design and application factors, five pages detailing test procedures, information on the LTC process which extends digital head life by a factor of 10, and a catalog section describing important electrical and mechanical parameters inherent to magnetic heads. Use card or write *Nortronics Company, 8101 Tenth Avenue, North, Minneapolis, Minnesota 55427.*

For more info circle 278 on Reader Service Card

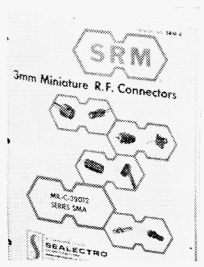
POWER-SYSTEMS BULLETIN describes a line of constant-frequency no-break power systems rated from 10 kW through 1,000 kW. The eight-page bulletin shows the two types of systems available, and includes typical specifications for each type. Use card or write *The Ideal Electric and Manufacturing Company, 330 East First Street, Mansfield, Ohio 44903.*

For more info circle 279 on Reader Service Card

1973 ELECTRONICS CATALOG features home entertainment products, audio equipment, citizens-band two-way radios, Micronta test instruments, Archer antennas, and Archerkit and Science Fair electronic and hobby kits. The catalog also lists thousands of hard-to-find or specialized electronic items such as tubes, transistors, cables, tools, connectors, wire, plugs and adapters for hobbyists, experimenters, technicians, and others. Use card or write *Radio Shack, Department R-26, 2617 West Seventh Street, Fort Worth, Texas 76107.*

For more info circle 280 on Reader Service Card

RF-CONNECTORS MANUAL features connector photos, dimensional drawings, and technical specifications for a line of 3-mm miniature RF connectors. A wide range of connector-to-cable constructions are described including direct-solder, solder-clamp, and clamp for semi rigid cable; and direct-solder, clamp and crimp type for braided cable. Use card or write *Sealectro Corporation, 225 Hoyt Street, Mararoneck, New York 10543.*

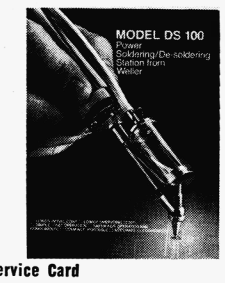


For more info circle 281 on Reader Service Card

SERVICES BROCHURE details the changed transmission format for WWV and WWVH standard time and frequency broadcasts. Included is information on a line of circuit-card accessories to adapt existing WWV receivers to the new services carried by the stations. Description of the transmission sequence, description of the time code on WWV, measurement of time, and other topics are discussed. Use card or write *Specific Products, A Division of The Dr. Henry L. Richter Corporation, 1237 South Shamrock, Monrovia, California 91016.*

For more info circle 282 on Reader Service Card

STATION BULLETIN describes and illustrates a portable power soldering/desoldering station. Included in the bulletin are complete technical data on advanced design features, materials of construction, electrical characteristics, and optional accessories. Use card or write *The Cooper Group, Weller Division, Post Office Box 728, Apex, North Carolina 27502.*

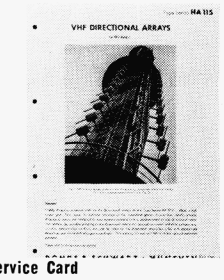


For more info circle 283 on Reader Service Card

TEST-EQUIPMENT LITERATURE presents over 50 new items of precision test equipment that operate in the WR-430 frequency range of 1.7 to 2.6 GHz. The model number, description, and price of the component is also available. The brochure has been prepared for inclusion in the company's microwave test-equipment catalog. Use card or write *Waveline Incorporated, Post Office Box 718, West Caldwell, New Jersey 07006.*

For more info circle 284 on Reader Service Card

VHF-ARRAYS LITERATURE presents the HA 115 Series of VHF directional arrays for the VHF band II. The literature includes diagrams, a basic description, a table of types and specifications, and construction information. Use card or write *Rohde & Schwarz Sales Company, 111 Lexington Avenue, Passaic, New Jersey 07055.*



For more info circle 285 on Reader Service Card

SOFTWARE BOOKLET details the operation of software packages offered with the 620 computer family. Described in depth is VORTEX, a multitask real-time operating system for the Model 620/f. The booklet also highlights the features of MOS, a comprehensive batch operating system, FORTRAN IV, and RPG IV, an easy-to-use business language. Use card or write *Varian Data Machines, 2722 Michelson Drive, Irvine, California 92664.*

For more info circle 286 on Reader Service Card

COMPONENTS GUIDE lists hundred of coaxial components and accessories for high-frequency applications to 9 GHz. Included are detailed specifications for general-purpose and precision 50-ohm and 75-ohm connectors, adaptors, attenuators, terminations, 2- and 3-port coupling elements, and others. Use card or write *General Radio, 300 Baker Avenue, Concord, Massachusetts 01742.*

For more info circle 287 on Reader Service Card

COMPUTER-SYSTEMS BROCHURE describes the space ultra-reliable modular computer (SUMC) LSI computer systems which are designed to meet current and future needs for advanced defense and space data-processing systems. The brochure covers requirements, features, system options, technology, architectural formats, interrupt facilities, and software compatibility. Use card or write *RCA Advanced Technology Laboratories, Building 10-4, Camden, New Jersey 08102.*

For more info circle 288 on Reader Service Card

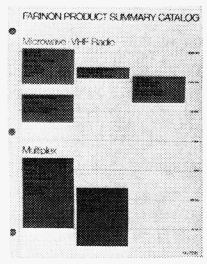
POTENTIOMETERS BROCHURE features portable potentiometers, including the Versapot which takes the place of five different measuring instruments. The brochure lists the ranges and gives detailed specifications for each model, and illustrates a number of accessories. Use card or write *James G. Biddle Company, Township Line and Jolly Roads, Plymouth Meeting, Pennsylvania 19462.*

For more info circle 289 on Reader Service Card

CAPABILITIES LITERATURE describes the company's engineering and production capabilities, and contains a spread which deals with activity in designing and producing the "Golden Umbilical" used by Commander Ed White for the United States' first space walk. Also covered are photographs and technical explanations of plant facilities and examples of assemblies produced for various customers. Use card or write *Air Borne Controls Incorporated, 9939 Glenoaks Boulevard, Sun Valley, California 91352.*

For more info circle 290 on Reader Service Card

PRODUCT-SUMMARY CATALOG includes specifications for multiplex and microwave systems operating in all point-to-point frequency bands through the 13-GHz region. Systems described are capable of handling up to 1200 multiplexed voice or data channels, or video. Accessories are also listed. Use card or write *Farinon Electric, 935 Washington Street, San Carlos, California 94070.*

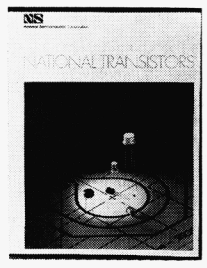


For more info circle 291 on Reader Service Card

AUDIO-VISUAL PRODUCTS PAMPHLET presents the 70 Series and 75 Series 16-mm sound/motion-picture projectors, filmstrip and slide projectors, rear-screen projectors, educational-television products including film chains and an image impresser, and a sound/slide system. Brief descriptions and photographs are provided for each product. Use card or write *Kalart Victor Corporation, Hultenius Street, Plainville, Connecticut 06062.*

For more info circle 292 on Reader Service Card

TRANSISTOR CATALOG provides complete data on an entire transistor line including NPN and PNP small-signal transistors, field-effect transistors, and proelectron types. Specifications, design/application data, and test limit information, plus a glossary of terms and package outlines are provided. Use card or write *National Semiconductor Corporation, 2900 Semiconductor Drive, Santa Clara, California 95051.*



For more info circle 293 on Reader Service Card

COMPONENTS MANUAL provides detailed technical data on fabricating and shielding, using AD-MU ductile foils, sheet stock, tape data protectors, various components, and custom-fabricated shields. Manufacturing facilities and techniques in the company's two Rochester plants are fully described and illustrated. Use card or write *Ad-Vance Magnetics, 226 East Seventh Street, Rochester, Indiana 46975.*

For more info circle 294 on Reader Service Card

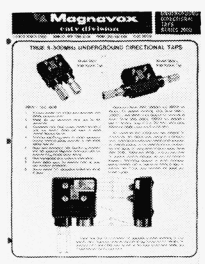
EQUIPMENT FOLDER features the TE 308 SH time-sharing terminal with a separate 10-key numeric keyboard for high-speed entry of numeric data. Specifications are included on the paper-tape reader, answer-back device, control console, printer, paper-tape punch, transmission, and the keyboard. Two keyboard configurations are illustrated. Use card or write *Olivetti Corporation of America, 500 Park Avenue, New York, New York 10022.*

For more info circle 295 on Reader Service Card

TELPAK-ANALYSIS BROCHURE presents the Telpak method of reducing the cost of a corporate private-line telephone network. Topics the brochure covers include what is Telpak, Telpak building blocks, how Telpak works, the Telpak Optimization Problem, can a Telpak network be changed, and background information. Use card or write *James E. Ruttenberg Company, 2 Overhill Road, Scarsdale, New York 10583.*

For more info circle 296 on Reader Service Card

DIRECTIONAL-TAPS SHEET describes and illustrates the 2600 Series of underground directional taps for the 5-300-MHz range, designed for pedestal, vault, or direct burial. Full specifications, key features, and cutaway diagrams are given for the taps. Use card or write *The Magnavox Company, CATV Division, 133 West Seneca Street, Manlius, New York 13104.*

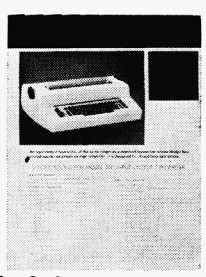


For more info circle 297 on Reader Service Card

TIME-CODE-FORMAT BOOK gives drawings and characteristics of about two dozen of the most commonly used codes, including the IRIG standards, NASA, various range codes, and special serial codes. A glossary of terms, abbreviations, and reference is included, defining the jargon used in typical applications where masses of data are correlated to a precision time standard. Use card or write *DATUM, Timing Division, 170 East Liberty Avenue, Anaheim, California 92801.*

For more info circle 298 on Reader Service Card

TYPEWRITER SPEC SHEET provides data on signals to and from the typewriter, connectors, power requirements, environmental conditions, and optional control features for the Model 300 I/O typewriter. Photographs are also provided. Use card or write *Redactron Corporation, 100 Parkway Drive South, Hauppauge, New York 11787.*



For more info circle 299 on Reader Service Card

SWITCH-UNIT FOLDER describes and illustrates the Series "24" RF switches for 3-kHz to 100-MHz operation. The folder includes features, a general description, a block diagram, specifications, options, matrix control information, and ordering information. Use card or write *Aiken Electronics, 7411 50th Avenue, College Park, Maryland 20740.*

For more info circle 300 on Reader Service Card

Hy-Gain V-4231

(AS-1729/VRC military nomenclature)

Designed to meet the new B-specification

The V-4231 (AS-1729/VRC) is an omnidirectional, vertically polarized, center-fed, antenna assembly built to MIL-A-55288B (EL) specifications. It is fully compatible with military radios in a 10 band spectrum from 30 to 76 MHz and with previously manufactured AS-1729 equipment. It is designed for installation on military vehicles ranging from jeeps to shipboard applications. Bandswitching is manual and/or automatic, when operated with a compatible transceiver with automatic bandswitching.

The V-4231 consists of three units: MX-6707/VRC Base Matching unit with spring cable assembly; AS-1730/VRC Lower Antenna element; and AT-1095/VRC Upper Antenna element.

Specifications for the Model V-4231

Frequency Range:	30-76 MHz
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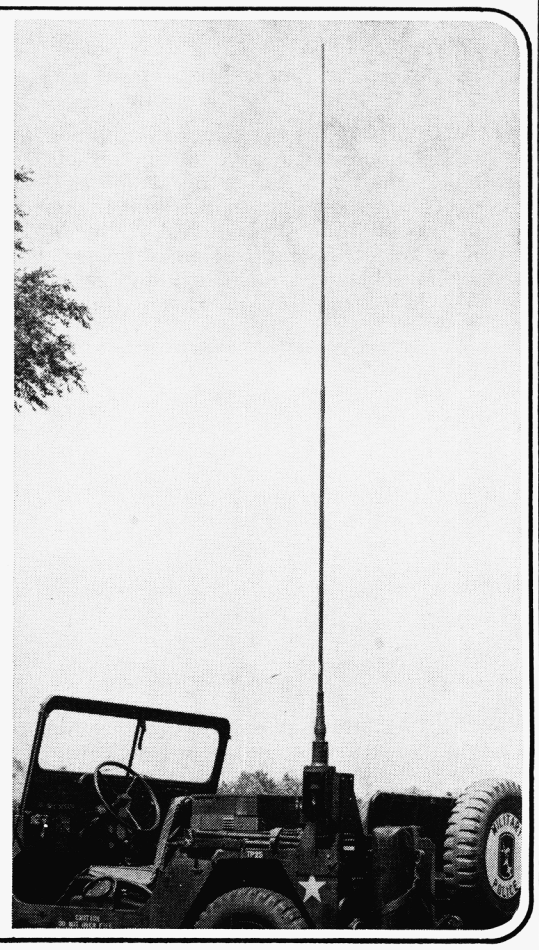
Input Impedance:	50 ohms
VSWR:	3.4:1 maximum
Operating Temperature:	−40F to 150F
Antenna Type:	Whip, fiberglass
Bandswitching Capabilities:	Automatic or manual, 10 bands

For further information, contact:

Hy-Gain Electronics Corporation

Box 5407 Lincoln, Nebraska 68505 402−434-9151 Telex 48-6424



Circle 100 on Reader Service Card

The last word . . .

Communications from our readers

Praise Prompt USITA Report

Sir:

To provide such comprehensive coverage of the USITA convention on so short a deadline must have required an all-out effort. I am sure your readers consider it a real service.

John D. de Butts
Chairman of the Board
AT&T
New York, New York

Sir:

We appreciate the great interest you have taken in our convention and I want to congratulate you on the excellent job of coverage.

William C. Mott
Executive Vice President
USITA
Washington, D.C.

Sir:

I have received your November issue of *Communications News* and wish to thank you for the most excellent coverage. I think the coverage in depth of the John deButts and Les Warner presentations is important to the entire Industry because of their content and current need.

In such prompt and complete coverage you have rendered an important service.

Tyler Ryan
Vice President
Lincoln Tel & Tel
Lincoln, Nebraska

Sir:

I enjoyed the article about the USITA convention in the November issue of *Communications News.*

Charlotte T. Reid
Commissioner
Federal Communications Commission
Washington, D.C.

Pre-Planning for BART

Sir:

The importance of pre-planning a modern communications system is being dramatically highlighted in the San Francisco Bay Area where the Bay Area Rapid Transit System was recently opened by President Nixon (see story, November *Communications News*).

This has been far more than just a regular installation project for the Bell System. We're really planning our communications system for the year 2.000," and this happens to be the biggest public one in the history of the company.

Apart from that, all the BART coin phone installations have been custom designed by architects working with Bell engineers, to harmonize with the decor of each station.

Our engineers worked closely with BART officials, local communities and 12 architectural firms for eight years. We had to submit our proposed conduits for inclusion in the blueprint specifications, even before they were put out to bid by the various communities involved.

The passenger stations have been individually designed to conform with the environment of each community serviced by BART in San Francisco, Alameda and Contra Costa counties. They have marked differences. For example, in Berkeley, the community voted to have the system built completely underground even though this meant considerably more expense. Elsewhere, the system is one third underground, one third elevated and one third at street level.

The phone company could do no less than match this strong local civic pride and no effort has been spared to make sure that coin phone installations conform with the environment of each station.

A good example is the MacArthur station in North Oakland. This is expected to be one of the busiest in the system since it will be a key transfer point. The passenger area has been designed with an attractive blend of tile, ceramic facings, burnished metals and natural woods. The phones are flush-mounted wall units, divided by partitions, finished in burnished steel and easily visible and accessible.

At other stations, the coin telephones blend flush into the walls without dividers, or stand out in central areas in the shape of 'trees'—a quadrangle shaped unit on a single post which allows four people at a time to make a call. Some stations have "Touch-Tone" units while others have conventional dialing installations.

Every BART station has one phone specially designed for the handicapped (see cuts below). These are mounted half way down the wall from the standard installations and are easily accessible from a wheelchair. Incidentally, their low position makes them ideal for children to use.

At each installation one phone is modified with a volume control unit for the hard of hearing. After a call is completed, a spring release automatically reverts the control to a normal position. All BART stations have been built with a passenger elevator to accommodate the handicapped.

The telecommunications system also features a Call Distributor system which will initially distribute calls to ten positions (see cut). This is located at BART's information center in Oakland headquarters and will be manned by multilingual operators able to speak Spanish and Chinese.

People in the Bay Area will be able to call BART by dialing their local prefix followed by 2278 (BART) and obtain free passenger information. Telephone service has been provided to cover the area and BART is distributing information about this on local television, in newspapers and display ads located in each station.

This will go even further than information about trains, because schedules will also be available giving connecting buses all over the area. It's another way of getting people out of the car into the train.

In addition, a PBX, also located at BART headquarters, will take care of regular administrative communications. An agent's booth in each station will also connect to the PBX. Inside the booth is a Dynamic Transmitter, specially designed to connect to the paging system. This was also included in the original specifications.

Three satellite PBX systems have been installed in BART's repair and service yards. We're anticipating future needs. For example, there will eventually be five PBX positions at headquarters, and the Call Distributor has the capacity for 60 positions, should these be required.

Pre-planning has been the key to the entire BART system, not just our portion of it. When you realize that most of the Bay will eventually be served, it's obvious that getting in right at the specification stage was vital.

Robert Brennan
Account Manager
Pacific Tel & Tel
Oakland, California

PATCO Preceded BART!

Sir:

I read your BART story (November issue) with great interest. But I wonder if you realize that we have had a virtually automatic rapid transit system here in New Jersey for several years.

Jacob Schaad
Hawthorne, New Jersey

▶ *Indeed we do. For a picture-story of the PATCO "Lindenwold High Speed Line" and its use of closed circuit television and two-way radio, see page 72.—Editor.*

Likes Yosemite Story

Sir:

I would like to congratulate you on your very interesting feature story on the Yosemite National Park. It was indeed a most complete coverage of a most interesting subject.

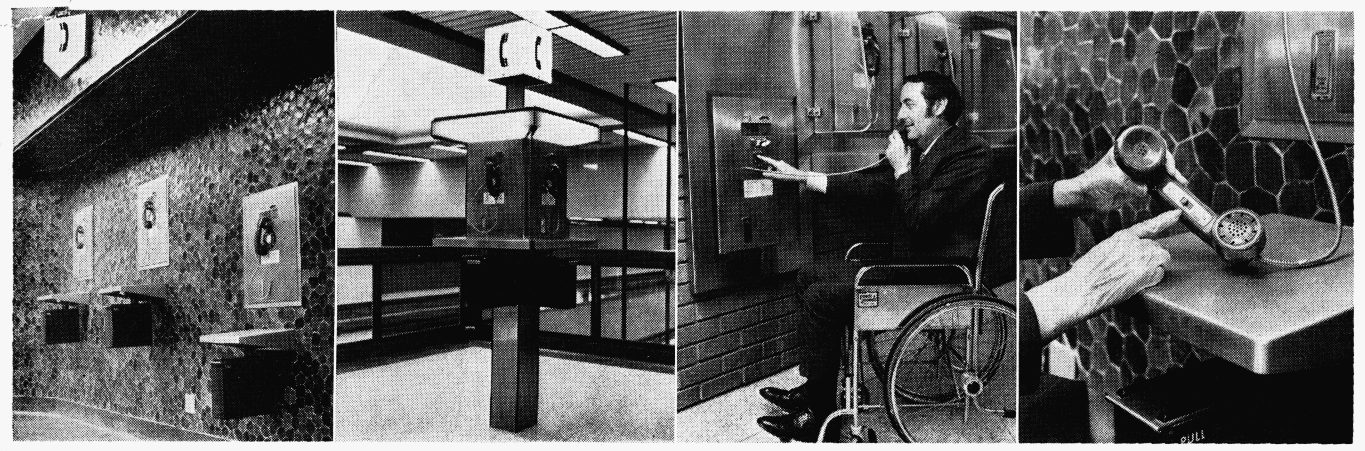
Robert K. Otterbourg
New York, New York

Paseba, CN!

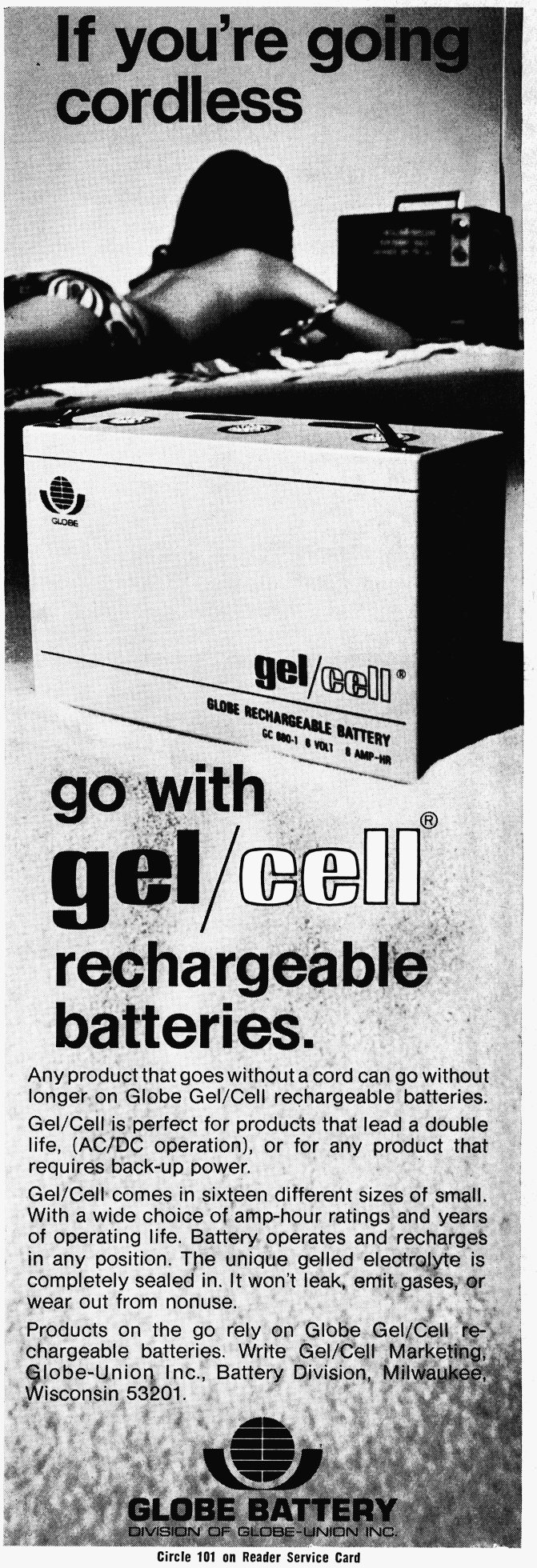
Sir:

On my return from a most interesting Trade Mission visit to Russia and Poland (see story, November *Communications News*) I found your ad-

Continued on next page



CN Reader Robert Brennan points out that public coin phones at BART stations have been custom-designed to complement station design. Shown here are three examples: one mounted flush to the wall, made from burnished steel which blends with the background of ceramic tiles; a quadrangular "tree" which can accommodate four callers, placed in a central position; and a special phone for the handicapped, similar to one installed in all 34 stations along a 75 mile route. All the handicapped phones are modified with a volume control unit for the hard of hearing, and an extra long handset cord. After a call is completed, a spring release in the handset (see illustration at right) automatically reverts the control to a normal position.



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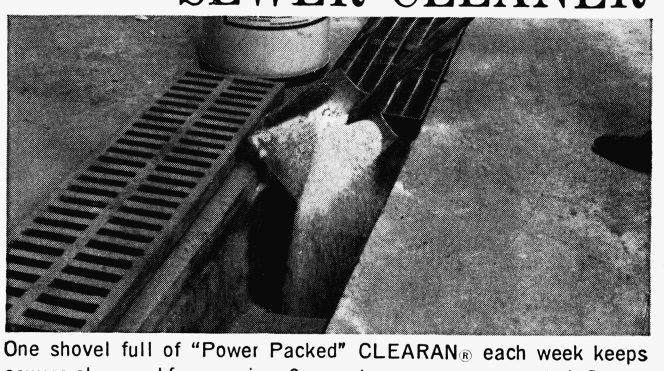

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More Last Word . . .

Continued from previous page

vance copy of the October *Communications News* right on the top of my mail pile. We certainly appreciate the fine coverage you have given General Electric in many past issues, but you have outdone yourself in this back-to-back featuring the presentations of both Dick Buesing and myself.

As my new formed acquaintances in Moscow would say, "Paseba."

Glenn R. Petersen
General Manager
Mobile Radio Products
General Electric Company
Lynchburg, Virginia

Appreciate TCA Coverage

Sir:

To say the coverage you gave our 1972 TCA Conference was outstanding, would be an understatement. In your own kind words, it was fabulous! The tradition of support that you have personally given organizations such as TCA has been superbly reflected through Communications News and is sincerely appreciated.

Lucky R. Marr
Manager
Communications Department
California State
Automobile Association
San Francisco, California

Sir:

Your coverage of the TCA conference was extremely comprehensive.

Richard N. Nathanson
Advertising Manager
Milgo Electronic Corporation
Miami, Florida

November Issue Excellent

Sir:

You are certainly to be congratulated on the fast response of putting the November issue of your fine publication to bed with full coverage of USITA. It was an excellent issue.

Q. R. Ball
Executive Vice President
Northern Telecom
Boston, Massachusetts

Praise for BART Story

Sir:

That was a fine story on BART. You haven't slipped a bit.

B. R. Stokes
General Manager
Bay Area Rapid Transit
Oakland, California

CATV Transcript Available

Sir:

I would like to call to your attention the availability of the National Cable Television Association's 1972 Marketing Workshop Transcript.

"The Selling of Cable Television: 1972," the official transcript of NCTA's first annual marketing workshop, is now available from the association.

The 368-page publication is the first comprehensive compilation of information in paperback book form on the current state of marketing cable television. The transcript is available at the following rates: NCTA members and associates, $1.95 per copy; non-members, $2.95 per copy; bulk orders of 35 or more copies, $1.50 per copy.

The first marketing workshop was held July 20-22 in Denver, Colorado. The transcript contains panel discussions by industry leaders and question and answer sessions on 13 cable television marketing subjects. They ininclude: direct mail and printing, advertising, marketing a top-100 market system, direct sales, telephone sales, marketing pay-cable and two-way services, handling disconnects, commercial marketing, and the public relations/marketing interface.

Copies of the transcript can be ordered by sending a check or money order to: *Marketing Transcript, National Cable Television Association, 918 Sixteenth Street NW, Washington, D.C. 20006.*

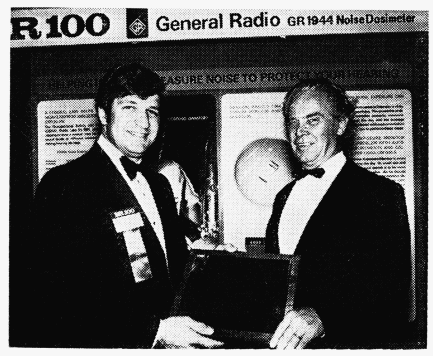
Considering the growing interest in cable television and its relevance to all segments of our society, I think it will interest your readers.

Ed Kaufman
National Cable Television Association
Washington, D.C.

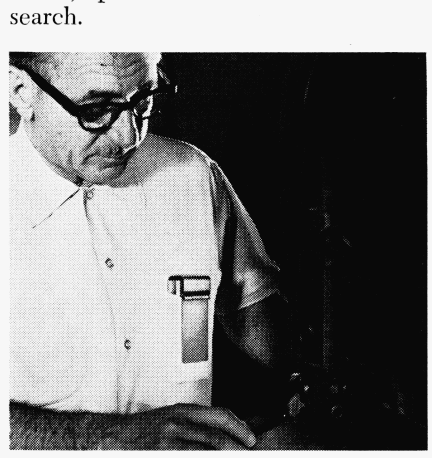
"Noise Dosimeter" Wins Award

Sir:

General Radio's Type 1944 Noise Dosimeter was a winner in the Industrial Research annual international competition (now in its tenth year) to select the 100 most significant technical products developed in 1972.



Shown in the picture (above) is Dr. Donald Sinclair (right), president of General Radio, receiving a plaque commemorating the award from Neil Ruzic, president of Industrial Research.



Winners of the competition were selected by a panel of distinguished scientists, including such familiar names as Dr. Wernher von Braun, William Lear and Dr. Harold Edgerton.

GR's Noise Dosimeter was developed as a lightweight, automatic instrument to measure on-the-job employee noise exposure in compliance with the provisions of the Occupational Safety and Health Act. The automatic instrument precludes the need for time-consuming sound-level measurements and complicated calculations normally required in calculating the noise exposure a worker has experienced during a full workday. The dosimeter consists of a 7½ ounce pocket-size monitor and a separate indicator. The monitor is worn by the worker (see cut above) during the day and automatically measures and computes noise exposure without any effort on the part of the worker. At the end of the day, the monitor is plugged into the companion indicator which indicates the noise exposure experienced by the worker during the workday.

Edward G. Rahaim
General Radio
Concord, Massachusetts

Like 3M Company Story

Sir:

I appreciated your November issue with the story on USITA and also the story on our internal communications system. Jim Jensen was very pleased with it, as was Bill Jensen of our corporate PR section, who felt it was a very good job.

Douglas E. Wachs
3M Company
St. Paul, Minnesota

Sir:

The 3M story on page 14 and the TCA report on page 26 are certainly very interesting. *Communications News* is a real benefit to telecommunications managers.

Roger C. Aude
Assistant Director for
Telecommunications Management
State Board of Control
Austin, Texas

"Vice" Eliminated!

Sir:

I found the November issue of *Communications News* most interesting, as usual, but was somewhat taken aback at the caption under my picture on page 42 describing me erroneously as "president of GTE Automatic Electric."

I realize that these things happen, but since the Marketing Organization at AE is a fulltime job, and since your book has a rather sizable reader ship throughout the communications industry, I would appreciate your printing a correction in your next issue so as to avoid creating any unnecessary confusion among our customers and suppliers.

W. S. Gage
Vice President—Marketing
GTE Automatic Electric
Northlake, Illinois

Our apologies. Our typesetter inadvertently took the "vice" out of Bill Gage's title . . . and five proof readers failed to catch the error. Robert Gressens is, of course, president of GTE Automatic Electric.—Editor.

CN Most Informative

Sir:

Communications News is perhaps the most informative and comprehensive periodical publication I have found covering the communications industry. You are to be congratulated on your effort.

Donald Latuk
Manager, Telephone Services
Ohio State University
Columbus, Ohio

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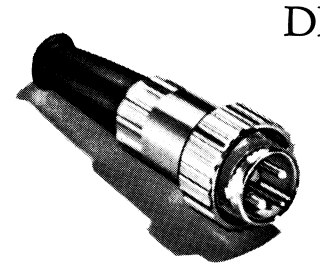

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Excellence throughout, low cost, wide variety of types and broad range of standard and optional features call-up practical and economical solutions to many design and cost-control problems in low level connections . . . particularly where miniaturization is a design consideration.

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Includes male and female plugs and receptacles from 2 to 7 contacts, in nickel-plated shells, or snap-on plastic shells. 13 different receptacles offer some form of internal switching (SPST, SPDT in addition to mating of contact circuits . . . in some instances eliminating need for external switches! Silver plated pins for low contact resistance. Exclusive "automatic" grounding and fool-proof polarization provisions. Contact friction coupling for minimal mechanical interference noise; lockring coupling for reliability where vibration is a factor. Ingenious 8-position right-angle plug enables you to position cable entry in any of 8 different angles. Etc., etc. Rugged and versatile . . . yet they cost surprisingly little.

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Virtually unlimited commercial, industrial, consumer and military applications in any type of low level circuitry: audio and test equipment, instruments, computers, cameras, control devices, communications equipment and business machines. Receptacles for flush, extended, P.C. board, screw and rivet type mounting; straight cord, 90° angle; control and switching plugs: many others.

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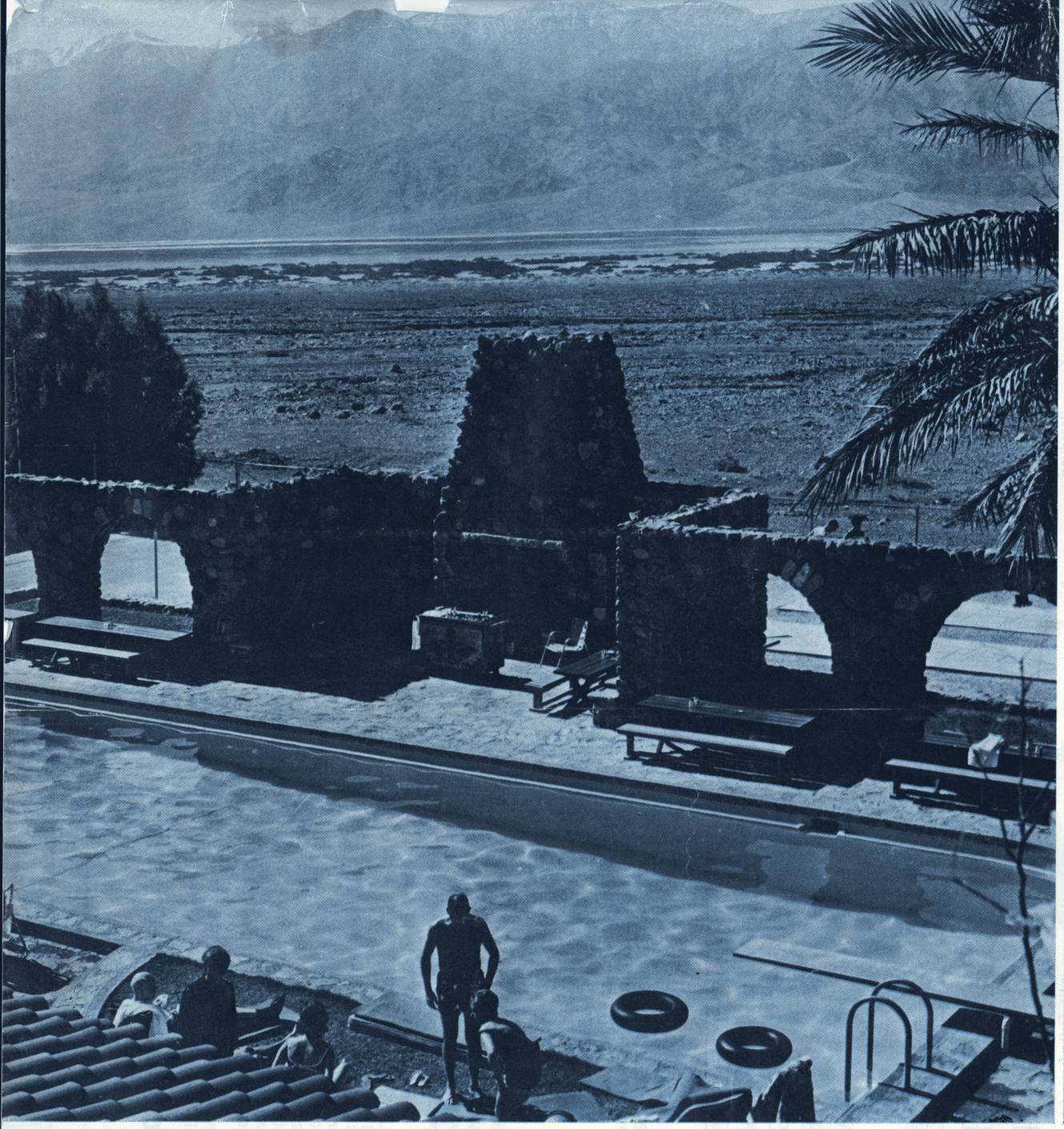

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- C CATV
- D Utility (Gas/Electric)
- E Airline & Airport
- F Bus & Rapid Transit
- G Marine
- H Pipeline
- J Railroad
- K Taxi
- L Trucking
- M Bank
- N College
- O Department Store
- P Hospital
- Q Industry
- R Logging
- S Mining
- T Stadium
- U Consultant

Government:

- V Administration
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- 6 OPERATION of communications facility
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3	23	43	63	83	103	123	143	163	183	203	223	243	263	283
4	24	44	64	84	104	124	144	164	184	204	224	244	264	284
5	25	45	65	85	105	125	145	165	185	205	225	245	265	285
6	26	46	66	86	106	126	146	166	186	206	226	246	266	286
7	27	47	67	87	107	127	147	167	187	207	227	247	267	287
8	28	48	68	88	108	128	148	168	188	208	228	248	268	288
9	29	49	69	89	109	129	149	169	189	209	229	249	269	289
10	30	50	70	90	110	130	150	170	190	210	230	250	270	290
11	31	51	71	91	111	131	151	171	191	211	231	251	271	291
12	32	52	72	92	112	132	152	172	192	212	232	252	272	292
13	33	53	73	93	113	133	153	173	193	213	233	253	273	293
14	34	54	74	94	114	134	154	174	194	214	234	254	274	294
15	35	55	75	95	115	135	155	175	195	215	235	255	275	295
16	36	56	76	96	116	136	156	176	196	216	236	256	276	296
17	37	57	77	97	117	137	157	177	197	217	237	257	277	297
18	38	58	78	98	118	138	158	178	198	218	238	258	278	298
19	39	59	79	99	119	139	159	179	199	219	239	259	279	299
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2	22	42	62	82	102	122	142	162	182	202	222	242	262	282
3	23	43	63	83	103	123	143	163	183	203	223	243	263	283
4	24	44	64	84	104	124	144	164	184	204	224	244	264	284
5	25	45	65	85	105	125	145	165	185	205	225	245	265	285
6	26	46	66	86	106	126	146	166	186	206	226	246	266	286
7	27	47	67	87	107	127	147	167	187	207	227	247	267	287
8	28	48	68	88	108	128	148	168	188	208	228	248	268	288
9	29	49	69	89	109	129	149	169	189	209	229	249	269	289
10	30	50	70	90	110	130	150	170	190	210	230	250	270	290
11	31	51	71	91	111	131	151	171	191	211	231	251	271	291
12	32	52	72	92	112	132	152	172	192	212	232	252	272	292
13	33	53	73	93	113	133	153	173	193	213	233	253	273	293
14	34	54	74	94	114	134	154	174	194	214	234	254	274	294
15	35	55	75	95	115	135	155	175	195	215	235	255	275	295
16	36	56	76	96	116	136	156	176	196	216	236	256	276	296
17	37	57	77	97	117	137	157	177	197	217	237	257	277	297
18	38	58	78	98	118	138	158	178	198	218	238	258	278	298
19	39	59	79	99	119	139	159	179	199	219	239	259	279	299
20	40	60	80	100	120	140	160	180	200	220	240	260	280	300

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